

## ABSTRACT

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INTERNATIONAL FINANCIAL INSTITUTIONS'  
AID

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The first half of the dissertation studies how conditional lending by International Financial Institutions (IFIs) affects the implementation of economic reforms. In the presence of asymmetric information about the outcome of a structural reform between an opportunistic agenda-setter government and an opposition with veto power, conditional lending by IFIs has a direct effect on the relative payoffs of domestic groups that results in a trade-off between increasing the range of parameter values for which reforms are adopted (and the payoffs from adoption), and lowering their payoffs if reforms are not adopted. Additionally, the combination of asymmetry of information and policy conditionality can render the government unable to credibly transmit information to the opposition, leading to a failure to adopt reforms or to a distortion of the incentives of incumbents regarding optimal macroeconomic policies, encouraging them to take actions that worsen macroeconomic outcomes in order to signal the desirability of some structural reforms.

The second half of the dissertation studies the impact of IFI aid on domestic conflict. Given an initial equilibrium in which domestic groups are in conflict over resources, an IFI's ability to limit a country's indebtedness may lead to an increase in the amount of resources devoted to production, thus increasing welfare. However, there is a trade-off because such a policy entails costs to society in terms of a reduced possibility of consumption smoothing. Additionally, it can result in a re-distribution of power among domestic groups, a result that can help identify and explain differing attitudes towards IFIs within developing economies.

ESSAYS ON THE POLITICAL ECONOMY OF INTERNATIONAL FINANCIAL  
INSTITUTIONS' AID

by

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## **Introduction**

This dissertation studies how lending practices of International Financial Institutions (IFIs) affect borrowing countries, focusing in particular on the political factors surrounding financial arrangements that determine economic outcomes. As in any political economy model, heterogeneity of interests plays a key role in explaining such outcomes. One type of heterogeneity that is frequently analyzed in the literature occurs when the objectives of the IFI and the borrowing country do not coincide, as is the case in most private lending transactions. Although I acknowledge this potential source of conflict, this dissertation focuses on a second type of heterogeneity, which arises when political groups within the country are affected in different ways by IFI lending. In this context, IFI lending practices might change the relative payoffs of different groups, by directly changing their payoffs from economic outcomes or their bargaining power. Alternatively, they can change the information they possess, substantially affecting the implementation of policies and the domestic political equilibrium.

Chapter 1 of the dissertation discusses the effects of policy conditionality, by which IFIs require the implementation of certain specific policies as a condition for the approval or continuation of their financing agreements. The chapter studies how in the presence of asymmetric information about the outcome of an economic reform between an opportunistic agenda-setter government and an opposition with veto power, conditional lending by International Financial Institutions (IFIs) has a direct effect on the relative payoffs of domestic groups that results in a trade-off between increasing the range of parameter values for which reforms are adopted (and the payoffs from adoption),

and lowering their payoffs if reforms are not adopted. Additionally, it shows that the combination of asymmetry of information and policy conditionality can render the government unable to credibly transmit information to the opposition, leading to a failure to adopt reforms or to a distortion of the incentives of incumbents regarding optimal macroeconomic policies, encouraging them to take actions that worsen macroeconomic outcomes in order to signal the desirability of some structural reforms.

Chapters 2 and 3 of the dissertation analyze the effect of IFI lending on recipient countries when domestic groups acquire resources through appropriative methods. Since borrowing countries rarely have a well defined institutional framework for allocating resources and distributing wealth, the assignment of property rights is usually associated with appropriation in general, and coercion in particular. In this case, domestic groups face a trade off between production and conflict, which usually results in total resources in the economy not being maximized. Chapter 2 considers the symmetric case where domestic groups have identical conflict and productive technologies, and tries to assess the question of whether IFIs have effective instruments at their disposal to reduce appropriation and encourage productive effort. It shows how an IFI's ability to limit a country's indebtedness may lead to an increase in the amount of resources devoted to production, thus increasing welfare. There is a trade-off, however, because such a policy entails costs to society in terms of a reduced possibility of consumption smoothing. Whether a partial or complete cut off in aid is optimal depends on parameter values such as a group's productivity or the decisiveness of its fighting efforts.

In Chapter 3, I conduct the same analysis under the assumption that domestic groups have asymmetric conflict or production technologies. I show that on top of the effects

analyzed in chapter 2, a decision to cut lending can result in a re-distribution of power among domestic groups, if changes in the amount of indebtedness not only affect the amount of conflict, but also its outcome. This can help identify and explain differing attitudes towards IFIs within developing economies.

# **Chapter 1: Economic Reforms under Asymmetric Information and IFI Conditionality**

## **1. 1. Introduction**

Different political economy explanations have been put forward to explain the conditions under which reforms –i.e. the adoption of superior policies- are (not) implemented. Underlying all these explanations is a conflict of interest between different individuals or groups. Authors like Benhabib and Rustichini (1996) and Tornell (1998) argue that the adoption of policies depends on the conflict among different vested interest groups and on their relative bargaining power. Others (Alesina and Drazen (1991), Drazen and Grilli (1993)) argue that reforms are a public good in that their benefits accrue more widely than their costs, so that a conflict of interest arises that may result in delay or non-adoption of reforms. There are also models (Fernandez and Rodrik (1991) and Rodrik (1993)) in which reforms are expected to benefit a majority ex-post, but individuals or groups are uncertain whether they are going to be winners or losers, which can result in ex-ante rejection of the reform; here the conflict of interest is not between groups, but between ex-ante and ex-post preferences within groups.

While there is no doubt that these explanations help us understand the difficulties in adopting reforms, I will focus my attention on an alternative story, namely the failure of policymakers to communicate relevant information to groups that have power to block reforms. Countries carry out reforms in the presence of substantial uncertainty about either their outcomes, such as their costs, or the characteristics of the policymakers themselves, such as their degree of commitment to the reform. Furthermore, the

distribution of information among different agents is usually uneven, as the proposers of policies usually are better informed than other participants. The prospects of reform thus may depend on whether the better informed agents are able to convey information to the uninformed agents. A similar problem, in the context of elections and partisan preferences, has been analyzed by Cukierman and Tommasi (1998)<sup>1</sup>.

One additional feature of reform strategies in developing countries is that reform often occurs against the backdrop of International Financial Institutions' (IFIs) lending programs. The way in which these lending programs are implemented can potentially have an impact on the political economy of reforms. Motivated by these facts, I study how IFIs and their lending practices affect the ability of governments to convince other groups that reforms are indeed desirable, in a context of asymmetry of information.

From the mid-1980s onward, IFIs have emphasized the proactive use of conditionality in their loans, which the IMF defines as “the explicit link between the approval or continuation of the IMF’s financing and the implementation of certain specific aspects of the government’s policy program” (IMF, 2001). Despite recent efforts to streamline conditionality<sup>2</sup>, it is still far ranging, and consists not only of short-term monetary and fiscal management requirements, but also of conditions covering medium-term structural aspects of the economy. In the latter case, structural conditionality is normally monitored on the basis of “structural performance criteria”. These include the explicit requirement of prior actions and frontloading of policy measures, as well as conditioning future tranches of loans on the implementation of policies. When a

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<sup>1</sup> Other related examples are Rogoff (1990), Rogoff and Sibert (1988) and Cukierman and Liviatan (1991).

<sup>2</sup> See Erbas (2003).

condition cannot be objectively monitored, when reforms have long gestation periods or when non compliance is not enough to interrupt arrangements, “structural benchmarks” are used.

Both types of conditionality have recently been used to support IFI programs that called for public sector reform, liberalization of labor markets, price decontrols and deregulation. The Indonesian, Korean and Brazilian programs of the late 90s are examples of extensive structural conditionality, and the earlier years of this decade have also witnessed the use of structural conditionality by IFIs.<sup>3</sup>

From an economic standpoint, the puzzle is why there is a need for such conditions in the first place, since it is presumably in the country’s self interest to conduct reforms. As Drazen (2001) argues, the answer lies in the existence of conflicts of interest. The literature on IFI lending has focused mainly on two types of conflict. First, the objectives of the IFI and the borrowing country might not coincide, as is the case in most private lending transactions. In the case of international lending, countries typically don’t have international collateral to pledge, and IFI conditionality might be the best alternative to such collateral requirements. Imposing conditions on government policies can thus help solve any potential moral hazard problems in lending relationships. A second type of conflict arises when political groups within the country are affected in different ways by IFI lending. For example, opposition groups might have different objectives than the government and might be willing to exercise their political power to stop or significantly

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<sup>3</sup> For example, Brazil’s 2002 stand by agreement included structural benchmarks in the financial sector, Bolivia’s 2003 SBA-supported program focused on weaknesses in the financial sector and on fiscal discipline, and Ecuador’s 2003 program included structural performance criteria in areas of civil sector

alter the implementation of economic reforms. In this context, IFI conditionality in lending might change the relative payoffs of different groups (by directly changing their payoffs from economic reforms or their bargaining power) or the information they possess, substantially affecting the implementation of policies. Evidence suggests that both types of conflict are present in IFI lending<sup>4</sup>. Although I acknowledge that the objectives of IFIs and countries are usually not the same, I will focus on the second type of conflict.

Case studies suggest that resistance of special interests has led to the failure of IMF-supported programs in some countries.<sup>5</sup> Ethnic, linguistic, regional and purely economic divisions (usually in the presence of high transaction costs) often complicate policymakers' ability to undertake and sustain reforms. Econometric evidence in Ivanova et al (2003) confirms this hypothesis. Recently the IMF has been adjusting its policies in light of these findings. For example, efforts have been made to secure parliamentary support of reforms, as in Brazil's 2002 and Paraguay's 2003 agreements, while Argentina's 2003 stand by agreement required -as a structural performance criterion- approval of at least 20 governors of the creation of fiscal federalism institutions.

Various authors analyze the interaction between IFIs and domestic conflicts of interest. For example, Drazen (2001) and Mayer and Mourmouras (2002) consider

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reform, customs administration and tax reform law. See IMF (2005) for a discussion of these and other recent arrangements.

<sup>4</sup> Several IMF policy discussion papers and other theoretical papers address the issue of conflict between the IFI and the borrowing country. See for example IMF (2001a and b), Khan and Sharma (2001) and Cordella and Dell'Ariccia (2002). Svensson (2000) and Drazen (2001) are good examples of papers that deal with conflicts of interest within recipient countries.

<sup>5</sup> See IMF (2001 a and b), and the Report of the Group of Independent Persons Appointed to Conduct an Evaluation of Certain Aspects of the Enhanced Structural Adjustment Facility (1998).

interest groups that cannot be made worse off than in the pre-reform status quo, so that governments have to distort their policies to obtain approval. Under some circumstances, conditionality crucially affects the choice of policies and the resulting distortions. An example with domestic political constraints and asymmetric information is Ramcharan (2002), which analyzes the impact of IMF conditionality on protests and policy reversals with different types of governments and protest groups. As argued above, I believe that uncertainty about key aspects of the reform process and asymmetry of information between the government and interest groups are key features of the environment of reforms, and it is my ultimate goal to analyze the effects of such asymmetries in the political process and the impact of IFI conditionality on the payoffs to different groups, and on the ability of governments to transmit information to the opposition.

The rest of the chapter is organized as follows. In section 1.2, a simple political economy model aimed at explaining the effect of conditionality on structural reform approval is presented. In section 1.3, I develop the model for the case where macroeconomic policies are taken as given, and I show that IFIs can change groups' payoffs and can crucially alter the informational content of government's proposed policies, hence changing the incentives of both the government and domestic groups to adopt reforms. Section 1.4 presents the effects of policy conditionality when the government also chooses a macroeconomic instrument and shows that conditionality can give incentives to distort macroeconomic policies in order to signal relevant information about the structural reform process. Section 1.5 concludes.



## 1.2. The model

Consider an economy where policies result from the interaction between two different domestic groups: the government, which controls a macroeconomic instrument and can propose a structural reform, and the opposition, which has the power to veto the government's proposed structural reform.

Although the distinction between macroeconomic reforms and structural reforms is sometimes arguably subtle, macroeconomic reforms usually have immediate payoffs and widely distributed costs, while structural reforms have clearly defined losers *ex ante*, because they usually require elimination of advantages to special interests, and this makes them harder to implement. Rodrik(1996) makes a good case for keeping these two types of policies distinct, not only for analytical purposes, but also because of the different degree of consensus in the literature on what constitutes appropriate macroeconomic and structural policies. I will (somewhat artificially) simplify by assuming that all conflict in the model concerns structural reform.

The uncertainty and asymmetry of information in the model arise from structural reform. While the formulation of the model will be general, in the sense that I will not specify the kind of structural reform under consideration, the set up can be adapted easily to different contexts. Trade liberalization reforms usually result in labor reallocation whose costs are uncertain. External uncertain circumstances can result in unidirectional shifts in countries' preferred policies. Enterprise restructuring, privatization programs and decentralization of government projects carry a high degree of uncertainty about their

profitability. Finally, the adoption of a reform is usually associated with uncertainty about the government's commitment to the reform process.<sup>6</sup>

Regarding the asymmetry of information, I make an explicit distinction between an informed proposer of policies (the government), which sets the agenda of structural reform, and an uninformed chooser of policies (the opposition), which has the power to veto a government's proposal. This institutional arrangement is standard in political economy models and is realistic given that the former knows its commitment and capabilities, deals with public policy issues on a daily basis, has access to the advice of IFIs and other specialists, and possesses classified information.<sup>7</sup> It is also observed in many countries under IFI programs<sup>8</sup>.

Output, which will for simplicity be assumed to be equal for each group, is equal to  $Y(e, \alpha)$ , where  $e$  is a macroeconomic instrument (such as the exchange rate, controls on international capital movements, public sector expenditures, monetary supply or banking reserve requirements), and  $\alpha$  indicates the presence of IFI lending. Assume further that  $Y(e, \alpha) = \alpha Y(e)$ , where  $\alpha=1$  if there is no lending and  $\alpha>1$  if there is IFI aid. This is an easy way to capture the fact that the IFI improves macroeconomic performance (for example, by improving the credibility of government's policies or by solving balance

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<sup>6</sup> For models with these kind of features, see Cukierman and Tommasi (1998), Drazen and Grilli (1993), Dewatripont and Maskin (1995), Dewatripont and Roland (1992) and Fernandez and Rodrik (1991).

<sup>7</sup> See Cukierman and Tommasi (1998)

<sup>8</sup> See Rodrik (1996).

of payment problems) and that the effect of this lending is complementary with the effectiveness of government policy in raising output, as is standard in the literature.<sup>9</sup>

Structural reform results in payoffs  $\gamma_i - \beta$  for group  $i$ , where  $i = g$  (government) or  $o$  (opposition). The parameter  $\gamma$  is the (certain) benefit of the structural reform, while  $\beta$  is the stochastic cost of reforms. In particular,  $\beta$  is a random variable that takes the value

$$\begin{cases} \beta_{\text{low}} \text{ with probability } p \\ \beta_{\text{high}} \text{ with probability } (1-p) \end{cases}$$

where  $\beta_{\text{low}} < \beta_{\text{high}}$ . It is the stochastic nature of  $\beta$  that captures the uncertainty normally associated with structural reform processes. From a welfare point of view, a reform will be considered to be efficient if the joint payoffs of government and opposition are positive, i.e. if  $\gamma_g + \gamma_o - 2\beta \geq 0$ .<sup>10</sup>

We introduce asymmetry of information by assuming the government gets to observe the true realization of  $\beta$  before proposing the reform, while the opposition only knows its distribution. This creates a principal-agent problem, because the opposition

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<sup>9</sup> See for example Drazen (2000) and Mayer and Mourmouras (2002). The results would basically be the same if  $\alpha$  entered the benefits of macroeconomic reform additively, except that there would be no multiplicative interaction between structural reform and IFI aid, as in (1.32).

<sup>10</sup> In line with the literature on appropriation, I do not assume that the government maximizes welfare. Rather, I treat it as one of the interest groups that competes for resources. For a discussion, see Drazen (1999).

cannot in general be sure whether a proposal signals good news or is just a reflection of the proposer's self interest.<sup>11</sup>

Regarding the timing of the model, nature first determines whether the structural reform has low or high costs. After observing  $\beta$ , the government chooses macroeconomic policies and decides whether to propose the structural reform. In section 1.3, I will take macroeconomic policies as given, while in section 1.4 I will make them endogenous. The opposition then decides whether to accept or reject the structural reform.

Conditionality by the IFI takes the form of a take-it-or-leave-it offer of a "package" of lending in case of approval of the structural reform or no lending at all otherwise. If IFI conditions are met, then there is IFI lending that effectively improves macroeconomic outcomes. Conditionality thus essentially works as a bundling mechanism, by which the IFI is able to tie-in macroeconomic and structural reforms.<sup>12 13</sup> One important point is that even if reforms are sometimes considered structural benchmarks (as opposed to strict performance criteria), they may nevertheless affect the way in which IFIs treat the country's program. Anecdotal evidence suggests that observance of benchmarks results in improved relations with IFIs (including better treatment for waiver requests or for new loans) and/or explicit backing of the country's

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<sup>11</sup> These types of models require that no ex post compensation mechanisms be implementable because of excessively high transaction costs of compensation. For example, distortionary costs associated with revenue collection to finance transfers, asymmetric information on the losses incurred by various categories of losers, or lack of commitment of the informed party (time consistency issues might give it incentives to renege on its commitments).

<sup>12</sup> The issue of the credibility of such an offer is not analyzed, although it is certainly a relevant one.

<sup>13</sup> A realistic modification of the model would take into account the possibility that lending is conditional on  $e$ . However, in a related paper, Cordella and Dell'Ariccia (2002) argue that some inputs in the production function are not verifiable by IFIs, so that authorities retain some control over the

policies by IFIs, both of which result in relative macroeconomic improvements (for example by improving investors' expectations about the domestic economic situation).<sup>14</sup>

The model formulation may be understood to capture either a narrow definition of conditionality (the one that includes only structural performance criteria, the observance of which triggers IFI lending), or a broader definition, which includes structural benchmarks, with the above mentioned interpretation.

### **1. 3. No Macroeconomic Instruments**

Assume first that macroeconomic decisions are taken as given.<sup>15</sup> The government's decision then is solely whether to propose the structural reform or not, following its observation of the true value of  $\beta$ . Given this decision, the opposition will update its beliefs about the actual costs of reform by attempting to infer which node of the decision tree has been reached. In this context, the IFI will affect the outcome of the game in two different ways. There is a direct impact on the relative benefits of approving reforms for both the government and the opposition, since under conditionality the IFI improves macroeconomic outcomes only if the structural reform is implemented. There is

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macroeconomic policies. The authors also argue that some activities are inherently multitasking, so that the IFI could only exercise a partial control over authorities' policies.

<sup>14</sup> See IMF (2005) for a discussion about structural benchmarks and their similarities to performance criteria. In particular, the paper argues that the focus on ownership and criticality applies to structural benchmarks as well as performance criteria.

<sup>15</sup> This could be the limiting case of a small marginal impact of  $e$  on macroeconomic outcomes, or the result of a general political economy equilibrium between government and opposition, which jointly determine them. The assumptions of section 1.4 could also not apply if there is an independent third party such as the central bank, that does not accommodate the administration's policies, and in fact offsets their impact on macroeconomic outcomes.

also a potential indirect effect through the opposition's belief updating, because the existence of conditionality itself might affect the government's incentives to propose reforms, effectively changing the information that the opposition might be able to gather from the government's proposals.

Under a conditional lending scenario, the game would take the following form:

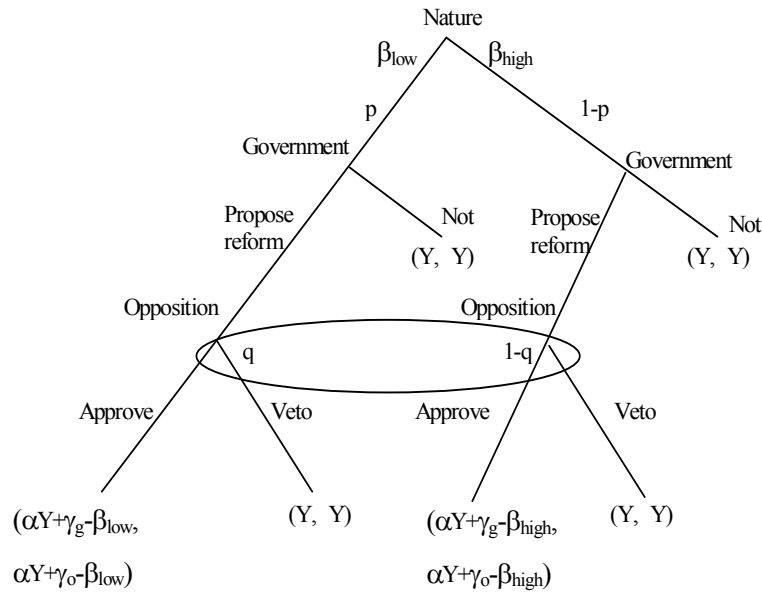


Figure 1.1: Extensive Form for the Conditional Lending Case.

Note that without a proposal or with vetoing of the structural reform, conditionality results in no lending at all and an exogenous level of output  $Y$ . On the other hand, conditionality implies a gain of  $(\alpha-1)Y$  for each group from approving the structural reform. The payoffs of each group from structural reform additionally depend on the actual cost ( $\beta$ ) and benefits ( $\gamma_i$ ). Finally, I denote by  $q$  the belief of the opposition that the structural reform is low cost.

Next, consider the situation where there is unconditional IFI lending:

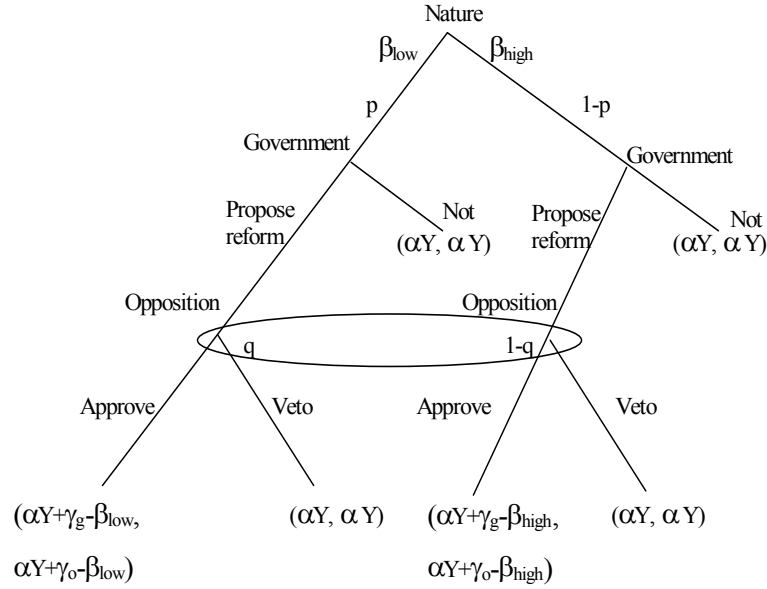


Figure 1.2: Extensive Form for the Unconditional Lending Case.

In this case, the IFI does not affect the desirability of approving the reform, since its lending is not conditional on the reform being approved in the first place. This means that the decision on whether to adopt the reform will not depend on the impact of IFI aid on the economy.

The model is a sequential game with incomplete information, and I look for a Perfect Bayesian Equilibrium (PBE) in pure strategies. Since the opposition doesn't observe the actual cost of reform, its strategy cannot be conditional on the value of  $\beta$ . It

will instead be based on the expected utility from approval of the reform. With conditionality, given its beliefs about  $\beta$ , the opposition approves reform if and only if

$$EU(\text{approval}) = q(\alpha Y + \gamma_o - \beta_{low}) + (1 - q)(\alpha Y + \gamma_o - \beta_{high}) \geq EU(\text{veto}) = Y \quad (1.1)$$

Simplifying, the reform is approved if

$$(\alpha - 1)Y + \gamma_o - [q\beta_{low} + (1 - q)\beta_{high}] \geq 0 \quad (1.2)$$

If there is no conditionality, output does not depend on whether the opposition approves or vetoes the reform. The opposition will approve if and only if

$$\gamma_o - [q\beta_{low} + (1 - q)\beta_{high}] \geq 0 \quad (1.3)$$

Comparing equations (1.2) and (1.3), we see that (1.3) requires that the expected payoffs from reform be positive, while under conditional lending this need not be the case. These equations reveal that conditionality directly affects the opposition's payoffs in a way that increases the expected utility from reforms, enlarging the range of parameter values for which the opposition approves the reform. However, conditionality also alters the government's payoffs, and this has an additional effect on the equilibrium by affecting the informational content of the reform proposal. If proposing reforms is optimal for the government regardless of  $\beta$ , then the opposition does not learn about the



actual cost of reforms from the fact that the government proposes them, and hence there will be no belief updating<sup>16</sup>. Under conditionality proposing reform is always optimal iff

$$\alpha Y + \gamma_g - \beta_{high} \geq Y \quad (1.4)$$

Without conditionality, proposing reform is always optimal iff

$$\gamma_g - \beta_{high} \geq 0 \quad (1.5)$$

Given equations (1.2), (1.3), (1.4) and (1.5), three relevant cases will be analyzed.

*Case I: Absence of a revealing equilibrium regardless of conditionality.*

Consider the case where both (1.4) and (1.5) hold. In this case, structural reform benefits the government regardless of  $\beta$  and regardless of IFI conditionality. The opposition learns nothing from the fact that there is a proposal, and its posterior beliefs about the cost of reform are equal to its priors, so that  $q=p$ . In this case, policy conditionality unambiguously raises the likelihood that reform will be approved,

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<sup>16</sup> Because of the simple structure of the model, proposing reform will actually at best be a weakly dominant strategy, since rejection of a proposal will result in the same payoffs for the government as no proposal. Considering trembling hand perfection could get rid of this problem. Alternatively, relatively straightforward (and realistic) changes could be made to the model that would result in a strictly dominant strategy. For example, since the IMF deals mostly with administrations rather than oppositions, it has been shown to be more lenient in its lending practices if the government shows willingness to present the reform, even if the reform is ultimately not adopted. This would lead to higher payoffs of the government even if the proposal results in rejection.

increasing the relative payoff of the opposition from a structural reform, as in Drazen (2001). Policy conditionality will tip the scale in favor of approval provided

$$\gamma_o - [p\beta_{low} + (1-p)\beta_{high}] < 0 \quad (1.6)$$

$$(\alpha - 1)Y + \gamma_o - [p\beta_{low} + (1-p)\beta_{high}] \geq 0 \quad (1.7)$$

In this case, the opposition's expected cost of reform is less than its expected benefit, unless the IFI sweetens the pot through conditional lending. Since the government is assumed to always win from structural reforms, conditionality in this case helps. Note that this does not necessarily mean that policy conditionality is welfare enhancing. Reform is socially efficient if and only if  $\gamma_g + \gamma_o - 2\beta > 0$ . Under policy conditionality, both parties may find it optimal to agree to reforms that are socially inefficient, in order to gain access to the extra  $(\alpha - 1)Y$  of output.

If both (1.6) and (1.7) hold, the expected value of conditional lending is

$$\begin{aligned} EV(C) &= p[2\alpha Y + \gamma_g + \gamma_o - 2\beta_{low}] + (1-p)[2\alpha Y + \gamma_g + \gamma_o - 2\beta_{high}] = \\ &2\alpha Y + p[\gamma_g + \gamma_o - 2\beta_{low}] + (1-p)[\gamma_g + \gamma_o - 2\beta_{high}] \end{aligned} \quad (1.8)$$

while the expected value of unconditional lending is

$$EV(NC) = 2\alpha Y \quad (1.9)$$

A comparison of (1.8) and (1.9) shows that the expected value of conditional lending is larger than the expected value of unconditional lending if  $\gamma_g + \gamma_o - 2[p\beta_{low} + (1-p)\beta_{high}] > 0$ , i.e. if the reform is expected to be efficient. This is immediately satisfied if reform is always efficient. On the other hand, if reform is efficient only when cost is low, it may be the case that conditionality decreases welfare because it results in approval even when cost is high.

*Case II: Fully revealing equilibrium regardless of conditionality.*

Now suppose that neither condition (1.4) nor (1.5) holds, so that the government wins from structural reforms only if cost is low, regardless of policy conditionality. In this case, the government can credibly convey information about the desirability of structural reforms, regardless of conditionality, because the government optimally proposes reform only if the costs from reform are low. Again, conditionality doesn't affect the government's ability to transmit information, but it has a direct effect on the relative payoffs from approval. Policy conditionality will tip the scale in favor of reform whenever

$$\gamma_o - \beta_{low} < 0 \quad (1.10)$$

$$(\alpha - 1)Y + \gamma_o - \beta_{low} > 0 \quad (1.11)$$

so that the opposition will approve reform only in response to the incentives offered by the IFI.

As in case I, conditionality need not enhance welfare, as it can lead to the adoption of reforms that are socially inefficient. If both (1.10) and (1.11) hold,<sup>17</sup>

$$EV(C) = p[2\alpha Y + \gamma_g + \gamma_o - 2\beta_{low}] + (1 - p)[2Y] \quad (1.12)$$

$$EV(NC) = 2\alpha Y \quad (1.13)$$

In this case,  $EV(C) > EV(NC)$  if

$$p[2\alpha Y + \gamma_g + \gamma_o - 2\beta_{low}] + (1 - p)[2Y] > 2\alpha Y \quad (1.14)$$

Rearranging, (1.14) becomes

$$p[\gamma_g + \gamma_o - 2\beta_{low}] > (1 - p)[2(\alpha - 1)Y] \quad (1.15)$$

Simply stated, (1.15) requires that the expected relative benefits of conditionality (getting approval of a reform when cost is low) be higher than those of no conditionality (presence of aid even if the reform is not approved, when the reform is a high cost one).

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<sup>17</sup> An additional requirement is that government wins from a mix of low cost reform and IFI aid so that it

### *Case III: Conditionality blurs information*

In cases I and II, policy conditionality affects the payoffs to reform but does not affect information transmission. In those cases, policy conditionality always increases the range of parameter values for which the opposition does not veto a proposal, although this might not necessary imply a welfare improvement upon unconditional lending, as shown above.

The crucial result in this section is that conditional lending may hinder the transmission of some useful information, and it may result in non approval of an efficient low cost reform. In order for this result to apply, two conditions need to be satisfied. First, information has to be blurred. Second, this information blurring must translate into a change in the optimal strategy by the opposition.

Regarding the first condition, if (1.5) is not satisfied but (1.4) is, conditional lending results in government having a dominant strategy in proposing reform. As a result of information blurring, the posterior beliefs of the opposition are going to be the same as prior beliefs, i.e. there is no belief updating. Without conditionality, however, a government's proposal immediately reveals that cost of reform is low, hence making it easier to satisfy the opposition's individual rationality constraint. On top of the direct effects of conditionality previously analyzed, case III displays an interesting feature: because of the existence of policy conditionality there is a deterioration in the ability of the government to transmit information. What drives this result is the fact that by bundling reform and macroeconomic policy, conditionality makes it worthwhile for the

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has incentives to propose reform.

government to propose a reform *even when it is costly*, and it is this *possibility* that results in a failure to communicate.

Regarding the second condition, if opposition's expected payoff is negative, and in particular if

$$(\alpha - 1)Y + \gamma_o - [p\beta_{low} + (1 - p)\beta_{high}] < 0 \quad (1.16)$$

then conditionality is not strong enough for the opposition to approve the reform. The following proposition provides a necessary condition for inequality (1.16) to apply.

**Proposition 1.1.** *A necessary condition for inequality (1.16) to hold is  $\gamma_g > \gamma_o$ .*

**Proof.** Suppose instead that  $\gamma_g \leq \gamma_o$ . Then  $(\alpha - 1)Y + \gamma_o - \beta_{high} > 0$ , because I assumed

$(\alpha - 1)Y + \gamma_g - \beta_{high} > 0$ , so that

$p[(\alpha - 1)Y + \gamma_o - \beta_{low}] + (1 - p)[(\alpha - 1)Y + \gamma_o - \beta_{high}] > 0$ , or

$(\alpha - 1)Y + \gamma_o - [p\beta_{low} + (1 - p)\beta_{high}] > 0$ , which contradicts inequality (1.16).

In order for information to be blurred, it is necessary that the government's benefits from reform be larger than those of the opposition.<sup>18</sup> Otherwise, the opposition would retrieve some valuable additional information from the government's payoffs, as it may not be known whether reform is high or low cost, but the opposition will be certain that if the government benefits from the mix of reform and IFI aid, so will the opposition.

Let us moreover concentrate on the case in which  $\gamma_o - \beta_{\text{low}} > 0$  and  $\gamma_o - \beta_{\text{high}} < 0$ . The reason for this choice is twofold. First, inequality (1.16) would not be satisfied if the opposition always won from reform, which would induce it to accept any proposal, even without knowing whether cost is high or low. There would still be a lack of information attributable to conditionality, but it wouldn't translate into a difference in the decision making process, which makes it an uninteresting case. If instead the opposition always lost from reform, it would never find it optimal to approve it in the unconditional lending case, so that information revelation wouldn't change the opposition's decision either.

Second, this special case displays a relative alignment in the interests of government and opposition, as they both lose from a high cost reform and win from a low cost one. In the absence of IFI aid, the government would in effect maximize welfare with its proposals.

In this case, if  $\beta = \beta_{\text{high}}$ , there is no proposal under unconditional lending, whereas IFI conditionality results in a proposal, but blurs the opposition's information and, given my assumption about the expected cost of reform, results in a rejection. Reform is not implemented in either case, but unconditional lending improves macroeconomic outcomes. If  $\beta = \beta_{\text{low}}$ , without conditionality, a government's proposal reveals the actual cost of reform, so that the opposition approves a proposal. With conditionality, the opposition's expected benefit is negative, which results in a veto.

$$EV(C) = 2Y \tag{1.17}$$

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<sup>18</sup> This is so because I assumed that  $Y$  and  $\alpha$  are the same for both groups. If this were not the case, the necessary condition would have to account for differences in these two variables.

$$EV(NC) = p[2\alpha Y + \gamma_g + \gamma_o - 2\beta_{low}] + (1-p)2\alpha Y = 2\alpha Y + p[\gamma_g + \gamma_o - 2\beta_{low}] \quad (1.18)$$

There is a welfare loss that stems from two sources: the IFI doesn't aid the country to improve macroeconomic performance, and an efficient reform is not approved. As a result,  $EV(C) < EV(NC)$ , because

$$2Y < p[\gamma_g + \gamma_o - 2\beta_{low}] + 2\alpha Y \quad (1.19)$$

Conditionality creates “mistrust” in a government's proposal, because conditional lending induces the government to propose a high cost reform, and macroeconomic improvements might outweigh reform losses for the government only and not for the opposition.

Next, consider the circumstances under which information blurring is more likely to take place. The following graph depicts inequalities (1.4) and (1.16) for different values of  $\alpha$ .



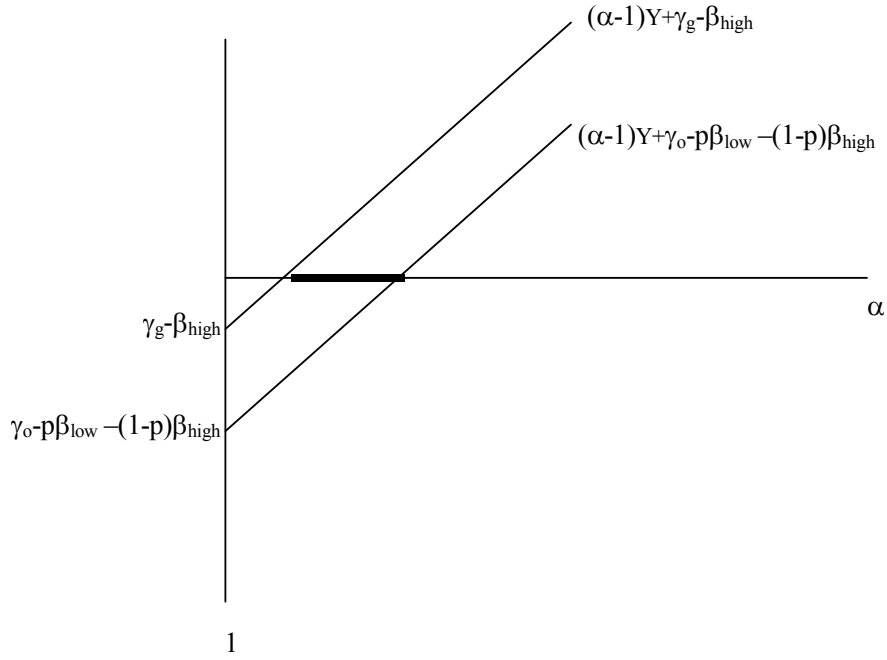


Figure 1.3: Range of values of  $\alpha$  for which conditionality blurs information.

Note that in order for the inequalities to simultaneously hold, the y-intercept of (1.16) must lie below that of (1.4), or

$$\gamma_o - [p \beta_{low} + (1-p) \beta_{high}] < \gamma_g - \beta_{high} \quad (1.20)$$

Rearranging, I get

$$\gamma_o + p(\beta_{high} - \beta_{low}) < \gamma_g \quad (1.21)$$

This means that the government's gains from structural reform not only have to be larger than those of the opposition (as in the above proposition), but by at least an amount proportional to the difference in cost between a high and low cost reform. This stronger necessary condition accounts for the fact that for (1.4) to hold, the government needs to benefit from a *high cost reform* while (1.16) requires that the opposition face an *expected loss*.

If (1.21) holds, there is a range of values of  $\alpha$  for which both (1.4) and (1.16) are satisfied. For small values of  $\alpha$ , aid does not have a large enough effect to induce the government to have a dominant strategy in proposing reform, as in the case of many regular programs. For large values of  $\alpha$ , the IFI's impact on the economy is large enough to compensate the opposition even in the wake of a high cost reform. This situation is likely to apply to large-scale international rescue packages such as the ones implemented in Mexico (1995) and Brazil (1998 and 2002). In the former case, privatization was a key aspect of structural conditionality in a program that consisted of IMF aid, guarantees and swaps from the US Exchange Stabilization Fund and short-term support from the BIS, totaling almost \$40 billion. In the latter case, the programs consisted of stand-by agreements of around \$18 billion (1998) and \$30 billion (2002), and included structural conditionality in the form of fiscal and social security reforms.<sup>19</sup>

IFI programs in other Latin American countries appear to satisfy intermediate conditions, where programs were not of such a massive scale but their effects were not

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<sup>19</sup> See "Drawing Lessons from the Mexican Crisis: Preventing and Resolving Financial Crises--the Role of the IMF", address by Michel Camdessus, Managing Director of the IMF at the 25th Washington Conference of the Council of the Americas, May 22, 1995. For Brazil's arrangements, see IMF's Press Releases No. 98/59 and No. 02/40.

negligible either. During the late 1990s market oriented governments repeatedly failed to get approval of important structural reforms that in hindsight could have been welfare enhancing. IFI policy conditionality was seen as benefiting incumbents and their constituencies at the expense of other groups. Recent examples include De la Rúa's failure to get approval of pension, labor and social security reforms in Argentina and Battle's failures in the deregulation of markets and reform of the pension and social security systems in Uruguay. These reforms were favored by the IMF and in some cases were directly included as performance criteria or structural benchmarks, with non observation by authorities resulting in a delay in the implementation of programs or in the release of further loan tranches. In other cases, the lack of compliance simply made it hard for the countries to obtain better conditions in future IFI programs (such as explicit IFI backing).<sup>20</sup>

A related question concerns the type of reform that is more likely to be linked with information blurring. Values of  $\gamma_g$  large relative to  $\gamma_o$  make informational problems more likely for a larger range of  $\alpha$ <sup>21</sup>. Governments that don't gain much from the reform are better able to transmit its desirability, a result similar to Cukierman and Tommasi (1998). In their paper, governments on one end of the ideological spectrum can better transmit information about reforms that imply policies usually associated with the opposite end of the ideological spectrum.

Consider next the values of  $\beta$ . The following graph depicts the conditions for  $\beta$  under which (1.4) and (1.16) hold.

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<sup>20</sup> See Independent Evaluation Office (2004), "The IMF and Argentina, 1991-2001", and IMF Country Reports No 01/90 (2001) and No 04/172.

<sup>21</sup> Also, the lower  $\gamma_o$ , the easier it is to satisfy (1.16)

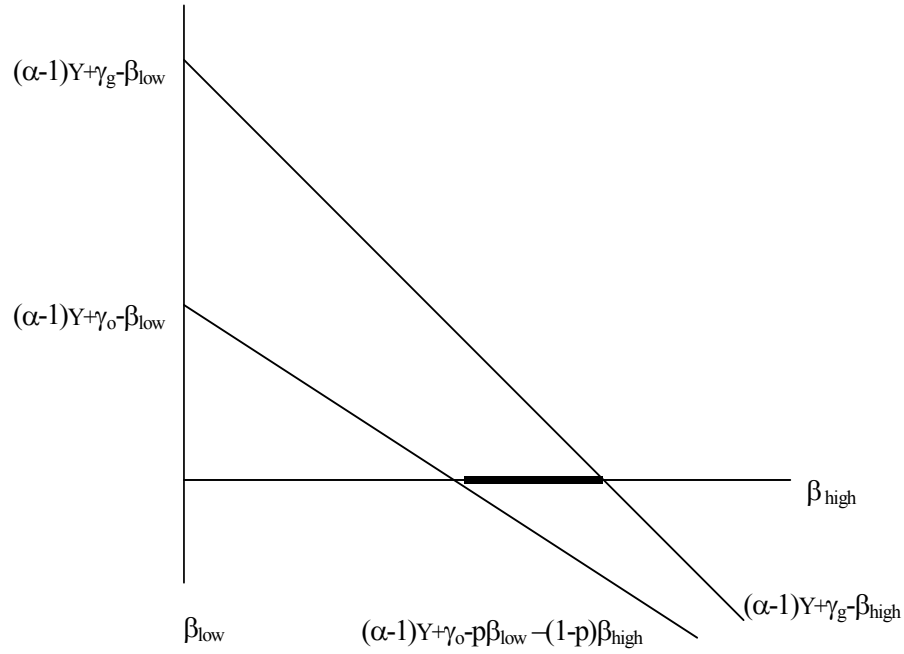


Figure 1.4: Range of values of  $\beta_{\text{high}}$  for which conditionality blurs information.

Note that since  $\gamma_g > \gamma_o$ , as  $\beta_{\text{high}}$  approaches  $\beta_{\text{low}}$ ,  $(\alpha-1)Y + \gamma_g - \beta_{\text{high}}$  becomes larger than  $(\alpha-1)Y + \gamma_o - p\beta_{\text{low}} - (1-p)\beta_{\text{high}}$ . In order for both (1.4) and (1.16) to hold, the slope of (1.16) has to be steep enough for it to cross the x-axis before (1.4). Intuitively,  $p$  has to be small, because a relatively large value of  $p$  means that the expected cost of reform is low enough for IFI aid to overcome the opposition's payoff from reform.

Note that information blurring requires intermediate values of  $\beta_{\text{high}}$ . Very large values of  $\beta_{\text{high}}$  make it easier for the government to signal information. For example, high costs of labor reallocation, high experimentation costs à la Dewatripont and Roland (1992), bad news about the time investments will take to become operational or about audits of firms to be privatized or restructured make it harder for IFIs to overcome

resistance to reform through their impact on macroeconomic outcomes, hence making it easier for the government to transmit information. On the other hand, values of  $\beta_{\text{high}}$  close to  $\beta_{\text{low}}$  make it more likely that the opposition's expected cost of reform is low enough for IFI aid to overcome it.

The information blurring case would be even more likely to apply in an alternative model in which a portion of IFI funds can be appropriated by the administration<sup>22</sup> in a way that makes it want to pursue a structural reform and accept IFI conditions even if reform is costly. In this context, it is no surprise that the opposition may block a reform that it expects to be damaging to its interests. What this section shows is that this expectation may be a result of IFIs' policies, because conditionality may blur the opposition's information by associating the appropriation with the approval of reform, thus effectively preventing the opposition from realizing that structural reform is worth carrying out.

#### **1. 4. Using macroeconomic instruments to signal information**

In section 1.3, I assumed away any choice over macroeconomic policies, by taking  $e$  as given. Consider instead a situation in which the government is able to take into account the economic environment when choosing macroeconomic policies. If the government is free both to choose macroeconomic policies (that determine output) and to propose structural policies, the choice of macroeconomic instruments can play two roles:

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<sup>22</sup> Here, instead of assuming  $\gamma_g > \gamma_o$ , it may be assumed that the payoffs from macroeconomic reforms are larger for the administration than for the opposition.

maximizing output and transmitting information about the true value of  $\beta$ . Note that in section 1.3, the “ability to communicate” was not controlled by the government, but rather depended on exogenous payoffs and/or IFI policies. In this section, control over the level of  $e$  will actually change the government’s ability to convey information. In particular, the analysis of case III above suggested that the absence of a revealing equilibrium stems from the fact that the government finds it optimal to propose reform regardless of its costs. Control over the macroeconomic instrument gives the government a way out of this problem, since it can use  $e$  to signal the cost of reform. Simply put, a weak macroeconomic policy may indicate that there are increased resources coming from structural reform. This amounts to a form of “brinkmanship”<sup>23</sup> with the aim of signaling private information through costly activities, or what is referred to in the literature as “money burning”.

Essentially, such resource dissipation can be part of a Perfect Bayesian Equilibrium in signaling games, and I am interested in finding a separating equilibrium in which the government fully reveals the cost of reform. Such an equilibrium requires that after observing any message from the government, the opposition has a belief about which type of reform it is facing reflected in a probability distribution. The opposition’s action (approve or not approve reform) must maximize its expected benefits, given those beliefs. For each reform type, the government’s message must maximize its utility, given the opposition’s strategy and beliefs. Finally, the beliefs must follow from Bayes’ rule and the sender’s strategy.

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<sup>23</sup> See Drazen (1999).

For a set of strategies that result in a revealing equilibrium, I make the simplifying assumption that output is a quadratic function of  $e$  that is maximized at  $e=\pi$ . Under this assumption, the requirements for a PBE are as follows.

- Government:

Choose  $e = \bar{e} < \pi$  if it observes  $\beta = \beta_{\text{low}}$ <sup>24</sup> and propose the structural reform.

Choose  $e = \pi$  if  $\beta = \beta_{\text{high}}$  and not propose reform.

This strategy results in a money burning game, since the government can afford to lower its efforts in macroeconomic policies when it is cheaper to do so, i.e. when structural reform is not particularly costly.

- Opposition:

Approve a proposal if  $e \leq \bar{e}$ .

Veto a proposal if  $e > \bar{e}$ .

To complete the PBE, the following beliefs are consistent with the government's strategy of lowering output if cost of reform is low:

$$\Pr ob(\beta = \beta_{\text{low}} / e > \bar{e}) = 0$$

$$Prob(\beta = \beta_{low} / e \leq \bar{e}) = 1$$

Under what conditions will these strategies form a PBE, and how does IFI policy affect these conditions? If IFI lending is conditional on reform these strategies will form a PBE if

- Given the strategy and beliefs of the opposition, the government optimally chooses  $e = \bar{e} < \pi$  if it observes  $\beta = \beta_{low}$ , rather than choosing  $e = \pi$  and not proposing the reform. This requires

$$\alpha Y(\bar{e}) + \gamma_g - \beta_{low} \geq Y(\pi) \quad (1.22)$$

- The government optimally chooses  $e = \pi$  and does not propose the reform if it observes  $\beta = \beta_{high}$  rather than choosing  $e = \bar{e} < \pi$  and getting reform approval. This requires

$$Y(\pi) \geq \alpha Y(\bar{e}) + \gamma_g - \beta_{high} \quad (1.23)$$

- Given the strategy of the government and its own beliefs, the opposition finds it optimal to approve the reform if  $e \leq \bar{e}$ . This requires

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<sup>24</sup> Given the symmetry implied by the functional form of  $Y(e)$ , this strategy could also be to choose  $\bar{e} > \pi$  if it observes  $\beta = \beta_{low}$ .



$$\alpha Y(\bar{e}) + \gamma_o - \beta_{low} \geq Y(\bar{e}) \quad (1.24)$$

- The opposition optimally vetoes the structural reform if  $e > \bar{e}$ . If this condition is satisfied for  $e = \pi$ , it will be satisfied for any  $e > \bar{e}$ , so that a sufficient condition for optimality is

$$Y(\pi) \geq \alpha Y(\pi) + \gamma_o - \beta_{high} \quad (1.25)$$

Equation (1.22) provides an upper bound on the amount of output that can be “destroyed” by the macroeconomic policy distortion, above which the government prefers not to propose reform even if cost is low. Equation (1.23) is a lower bound on the amount destroyed, below which the government prefers to propose reform even if the cost is high, which would eliminate the possibility of a separating equilibrium. Finally, equation (1.24) shows that output under the distorted policy has to be large enough for the opposition to approve the reform if it believes that cost is low.

When IFI lending is not conditional, the analogous conditions for the proposed PBE are:

$$\alpha Y(\bar{e}) + \gamma_g - \beta_{low} \geq \alpha Y(\pi) \quad (1.26)$$

$$\alpha Y(\pi) \geq \alpha Y(\bar{e}) + \gamma_g - \beta_{high} \quad (1.27)$$

$$\gamma_o - \beta_{low} \geq 0 \quad (1.28)$$

$$0 \geq \gamma_o - \beta_{high} \quad (1.29)$$

A brief comparison of the two sets of equations shows that IFI conditionality does indeed affect the government's ability to use distorted macroeconomic policy to convey information. Equation (1.26) is harder to satisfy than (1.22); the government will not be willing to distort policy as much in the absence of conditionality, because it does not need reform to benefit from IFI largesse. Equation (1.27) is actually easier to satisfy than (1.23), because without conditionality, the government is more likely to find reform unappealing when costs are high. Equations (1.28) and (1.29) show that unconditional lending makes the macroeconomy and the structural reform separable from the point of view of the opposition, which results in different approval and veto strategies. For example, under unconditional lending the opposition will veto any reform it perceives as costly, but under conditional lending these costs must be large enough to counterbalance the incentives provided by increased output levels. The impact of policy conditionality by IFIs will depend on the relative payoffs of the government and opposition, and on the comparison of these sets of equations for those payoffs.

Regarding unconditional lending, under the assumptions made for the information blurring case, (1.28) and (1.29) are immediately satisfied. Furthermore, note that since  $\gamma_g - \beta_{high} < 0$ , any  $\bar{e}$  satisfies (1.27), including  $\bar{e} = \pi$ . This is consistent with the results in section 1.3, where the government could transmit all the relevant information, and it means that the government doesn't need to distort macroeconomic policies in this context either.

Returning to the conditional lending case, note that since  $\alpha \geq 1$  and  $\gamma_o - \beta_{low} > 0$ , (1.24) holds for any  $\bar{e}$ . Next, (1.16) implies that  $(\alpha-1)Y + \gamma_o - \beta_{high} < 0$ , so that (1.25) holds. Hence, a separating equilibrium only requires (1.22) and (1.23) to hold, or

$$\frac{Y(\pi) - (\gamma_g - \beta_{high})}{\alpha} \geq Y(\bar{e}) \geq \frac{Y(\pi) - (\gamma_g - \beta_{low})}{\alpha} \quad (1.30)$$

Figure 1.5 depicts condition (1.30).

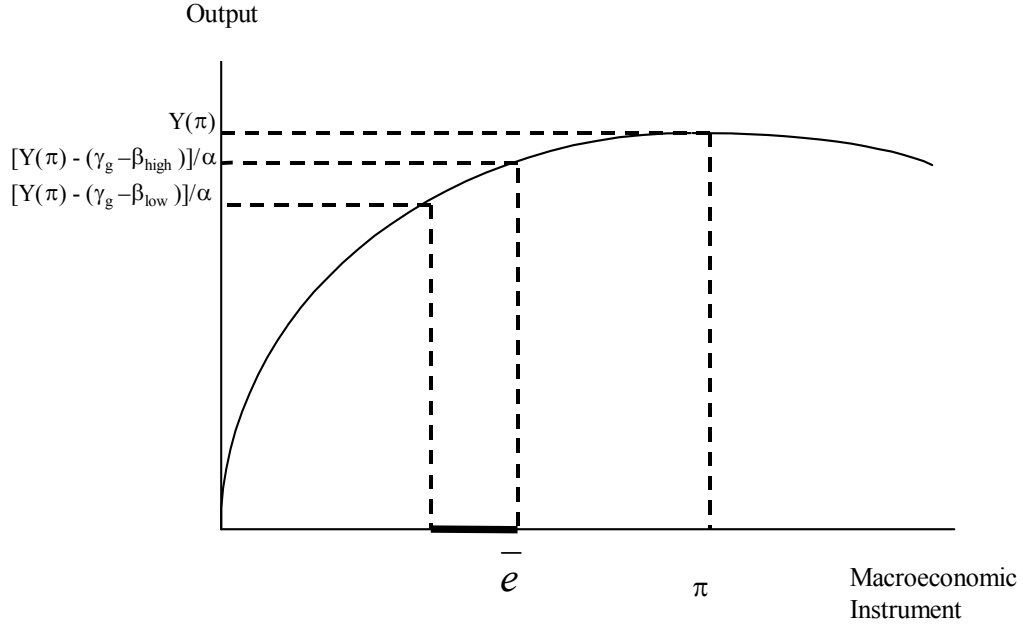


Figure 1.5: Revealing Equilibrium in a Signaling Game under Conditional Lending.

Note that in the information blurring case, (1.4) implies

$$Y(\pi) \geq \frac{Y(\pi) - (\gamma_g - \beta_{high})}{\alpha} \quad (1.31)$$

so that in a separating equilibrium  $\bar{e} < \pi$ . Furthermore, since the government will choose the highest possible output, (1.23) will hold with equality. In equilibrium, the government will be indifferent between choosing  $e = \bar{e} < \pi$  and proposing reform on the one hand, and choosing  $e = \pi$  and not proposing reform on the other. The solution for  $\bar{e}$  will be such that

$$Y(\bar{e}) = \frac{Y(\pi) - (\gamma_g - \beta_{high})}{\alpha} \quad (1.32)$$

For the parameter configurations satisfying case III above, reform is not possible when policy is exogenous, but will occur when the cost is low when the government is permitted to distort policy. Furthermore, lower  $\gamma_g$  or higher  $\beta_{high}$  make it easier for the government to transmit information to the opposition, so that less output destruction is needed.

Regarding the welfare implications of the equilibrium with money burning, the expected value of conditional lending is

$$EV(C) = p[2\alpha Y(\bar{e}) + \gamma_g + \gamma_o - 2\beta_{low}] + (1-p)[2Y(\pi)] \quad (1.33)$$

or using (1.32)

$$EV(C) = 2Y(\pi) + p[\gamma_o - \gamma_g + 2(\beta_{high} - \beta_{low})] \quad (1.34)$$

Recall that under exogenous policy, the expected value of conditional lending under the assumptions of case III was  $2Y(\pi)$ . The ability to control  $e$  improves welfare if the gains from a mix of reform and IFI aid are larger than the losses in output, i.e. if  $(\gamma_g + \gamma_o - 2\beta_{low}) > 2Y - 2\alpha Y(\bar{e})$ . The government is clearly weakly better off with the option of using  $e$  to signal information, since it could always choose to leave  $e$  undistorted and replicate its payoffs from the case of exogenous  $e$ . However, the government does not internalize the opposition's payoffs. The opposition might lose from the mix of a welfare enhancing reform and reduced output (recall that its benefits from reform are lower than the government's), and this loss might not be compensated by the gains of the government. This is more likely to happen if  $\gamma_o$  is low relative to  $\gamma_g$  (distorting output brings more benefits from reform for the government) and if  $(\beta_{high} - \beta_{low})$  is relatively low (more output destruction is needed to signal the cost of reform).

Finally, even when policy distortion is allowed, conditional lending still cannot improve upon unconditional lending, as IFI aid increases output in the unconditional case even when  $\beta = \beta_{high}$ , while the approval of a low cost reform does not require output destruction.

## 1.5. Conclusions

IFI conditionality acts as a bundling scheme that directly affects the relative payoffs from adopting reforms for the political groups involved, although to different extents. This effect is associated with a trade off between a higher likelihood of adoption

of reform and lower payoffs if the reforms are not adopted. The way this trade-off is resolved depends on the government's ability to communicate relevant information to the uninformed opposition.

In a context of asymmetric information, IFI conditionality also changes the informational content of the government's proposed policies. In particular, conditionality may actually increase government's payoffs from structural reform in a way that makes it unable to credibly transmit information about its desirability, which can result in non-implementation of reform. When the government has endogenous ways to transmit information, such as control of macroeconomic instruments, conditionality can instead distort the incentives of incumbents regarding the optimal macroeconomic policies, encouraging them to take actions that worsen macroeconomic outcomes in order to signal the desirability of structural reforms, effectively limiting the welfare gains from the adoption of structural reforms required by conditional lending, or turning them into losses.

These findings are relevant in evaluating IFI policies for a wide range of programs, since uncertainty and asymmetry of information are relevant scenarios for those countries that IFIs usually deal with. A better understanding of these issues might help to make sense of the frequent failure of developing economies to adopt desperately needed structural reforms. An interesting line for further research is to consider the case when IFIs have the same information about the cost of reforms as the government, a case that is realistic given that IFIs have highly qualified economists and that their officials usually meet with administrations. IFIs actions in this case could also signal the desirability of reforms, which could contribute to their successful implementation.

## **Chapter 2: Cooperation and Conflict in the Context of IFI Lending Programs: The Symmetric Case.**

### **2. 1. Introduction**

Countries that borrow from International Financial Institutions (IFIs) rarely have a well defined institutional framework for allocating resources and distributing wealth. The institutional background in these countries is usually not an effective means of assignment of property rights, which opens a role for their acquisition through coercion or appropriation. A trade off between production and conflict arises, and as a result total resources in the economy are not maximized, thus reducing economic welfare.

This chapter will try to assess the question of whether IFIs have effective instruments at their disposal to reduce appropriation and encourage productive effort and if so, under what domestic political conditions. One instrument available to an IFI is political conditionality, i.e. explicitly requiring the establishment of institutions designed to solve the problem of appropriative behavior as prior actions in its lending programs. The problem with this approach is that in many cases these requirements are far beyond the scope of IFI's area of specialization, as in the extreme case of civil war. Even if this were not the case, political conditionality may be seen as a direct attempt to intervene in a country's domestic politics, a point that Drazen (1999) addresses.

An alternative approach is for the IFIs to control the size of the loans and/or impose quantitative targets on key macroeconomic variables, without explicitly requiring

a set of political arrangements. If the degree of conflict depends on the overall level of resources in the economy, this indirect method can still help reduce conflict. Several papers have found a relationship between the overall level of resources in an economy and the level of appropriation. Examples of these are Benhabib and Rustichini (1991), Skaperdas (1992), Grossman and Kim (1996), Velasco (1997), and Tornell and Lane (1999).

In the context of IFI aid, Svensson (1999) and Drazen (1999) use game theoretic rent-seeking models where groups compete for common-pool resources and where the degree of appropriation is endogenous. Svensson (1999) considers a game where common resources can be invested in public goods or appropriated for private consumption. Inefficiencies may arise and cooperation among groups may break down because individual groups have incentives to behave opportunistically, even under repeated interaction. He finds that increases in government revenues from IFI aid may actually result in a failure of cooperation and increased rent-seeking. Drazen (1999) considers a model with similar features, but allows for a deterioration in the state of the economy as a result of appropriative behavior. The paper argues that denying aid (“selectivity”) can help to bring about a change in the political regime that may be needed to stop appropriation, after a period of deterioration.

Although close in spirit to this literature, this chapter of the dissertation differs in a number of ways. First, as Hirschleifer (1991) argues, “conflict, as opposed to mere failure of cooperation, comes about when one or more parties calls upon a special technology. To wit, a technology whereby some or all contenders for resources incur costs in an attempt to weaken or disable competitors”. The use of this technology entails



costs to society in the form of foregone opportunities to produce, direct destruction of resources or disruptions in the productive process. Conflict in countries that borrow from IFIs can take the form of strikes or pickets backed by political parties, rivalries between provincial “caudillos” or between tribes or ethnic groups in countries with substantial ethnic or religious fragmentation, judicial challenges to policies, hindering of quorum in congressional sessions to delay a vote on a particular policy, or political fights for land reform. In the worst case scenario, conflict results in open civil war. While coercion is obviously present in this last case, each of the previous activities involves contenders spending resources to weaken opposing contenders.

In the above mentioned papers, IFI disbursements can potentially lower appropriation because they are made conditional on cooperation by domestic groups. For example, if a particular group decides to appropriate some resources and defect from cooperation, its actions trigger appropriation by other groups and a cut-off of aid in the future, which changes the relative payoffs of non-cooperation. It is the expectation about this indirect effect of the IFI’s political conditionality that allows a cooperative equilibrium in repeated interaction games to be supported. Instead, our model considers a type of prisoner’s dilemma problem in which the absence of a complete assignment of property rights results in domestic groups trying to acquire property rights over common resources through coercion. The degree of conflict will depend on the overall level of resources that groups can appropriate, and this dependence will be a function of the values of parameters that affect the trade-off between conflict and productive technologies, and in particular on the above mentioned conflict technology.

When conflict is a problem, IFIs can adjust their lending practices to the characteristics of the countries undergoing conflicts. This is a relevant alternative, since developing countries typically need borrowing, both because of inter-temporal smoothing concerns and because conflict tends to increase their financial needs.<sup>25</sup> In this context, we assume that the country has no access to private capital markets and – in the absence of IFI aid- is thus credit constrained. An IFI will be able to affect the domestic equilibrium by choosing whether or not to relax the credit constraint, rather than by making direct aid conditional on certain policies being undertaken. In our basic set up, with unlimited IFI loans, the winner of the conflict will want to smooth consumption over time. This fact in turn affects the incentives of groups at the conflict stage, as a marginal increase in fighting effort –although costly to total welfare- does not imply inter-temporal distortions in the marginal utility of consumption. If instead IFIs limit consumption smoothing, either by imposing deficit/ debt targets or simply by setting the size of the loan at a level at which the credit constraint will be binding, an increase by either group in efforts devoted to productive activities will at the margin relax the borrowing constraint by reducing financing needs, which provides incentives to devote fewer resources to fighting efforts. Such IFI actions would not be explicitly directed at changing a regime into a cooperative one. They would rather implicitly result in an incremental change in the regime if they are in fact successful in encouraging production and reducing conflict. Put differently, a country under IFI constraints might borrow fewer resources, but it will instead “import” the credibility necessary for reducing conflict (or avoiding it all

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<sup>25</sup> For a discussion of how IFIs view conflict, see the Conflict Analysis Framework, by the Conflict Prevention and Reconstruction Team, at the Worldbank’s Social Development Department ([www.worldbank.org](http://www.worldbank.org))

together). This import will come at the cost of reducing consumption smoothing, and its relative price will depend on the trade off between production and the group's desired use of the conflict technology.

Finally-and perhaps most importantly- our approach will enable us to consider the effect of IFI lending on the domestic distribution of power. If not only the *amount* of conflict but also its *outcome* depends on the overall level of resources, IFI lending will effectively contribute to shape the distribution of power among domestic groups. To address this issue, we will explain conflict as a contest among players with the acquisition of property rights over the contested resources as the prize. We will follow authors like Hirschleifer (1991), Skaperdas (1992) and Nti (1997), who evaluate competing groups' relative efficiency in production versus conflict technologies to endogenously determine the size of the prize and the distribution of power among them (i.e. their probability of winning the contest) when property claims are not perfectly established.

In section 2.2, a model of cooperation and conflict in the presence of IFI aid is introduced. In section 2.3, the model is developed for the symmetric case, i.e. where domestic groups have equal fighting and production technologies. We show how given an initial equilibrium in which domestic groups are in conflict over resources, an IFI's ability to limit the amount of indebtedness by the establishment of fiscal targets may lead to more resources being devoted to production, as opposed to conflict, by partially solving the domestic prisoner's dilemma problem through a change of total resources. However, there is a trade-off, because such a policy entails costs to society in terms of a reduced possibility of consumption smoothing. The optimal IFI policy depends on the

nature of the power struggle and the shape of the production functions. Section 2.4 concludes.

## 2.2. The model

There are 2 domestic groups, labeled 1 and 2, whose interaction determines the levels of conflict and indebtedness, subject to debt constraints imposed by the IFI. The groups may be powerful interest groups, political parties or different arms of the government. The model lasts 2 periods. Decisions take place in period 1 and involve three stages. First, the IFI announces a target  $\bar{b}$  for debt, which is the maximum amount that it is willing to lend to the country. Then both groups simultaneously decide the level of resources to devote to productive or fighting activities,  $x_i$  and  $y_i$  respectively. Finally, the winner of the contest chooses the amount of borrowing.

Total resources for each group are normalized to 1 ( $x_i + y_i = 1$ ). These choices determine  $p(y_1, y_2)$  and  $1 - p(y_1, y_2)$ , the probabilities that groups 1 and 2 respectively win the resources from conflict, which are functions of fighting efforts by both groups, and  $f(x_1, x_2)$ , first period output in the economy, which is a function of productive efforts by both groups. Output is thus a jointly produced good subject to “capture” by the winner through appropriative activities. Both the conflict and production technologies are common knowledge.

The function  $p(.,.)$  is usually called a Contest Success Function (CSF) in the literature, and can be interpreted as an endogenously determined measure of power.

Although a more detailed discussion of its properties is postponed, standard assumptions on the CSF are:

- win probabilities are increasing in a group's strategy and decreasing in the opponent's strategy.
- It becomes harder to increase one's power on the margin when it is already higher than that of the opponent's.

We will assume that second period output  $Y_2$  is exogenous, so that first period choices of  $x_i$  and  $y_i$  determine the size and the distribution of total period 1 and 2 resources. The contest for resources occurs only in period one.<sup>26</sup>

As mentioned above, after the contest the winner makes a second choice related to debt financing. The fact that the decisions on productive and fighting efforts are undertaken before this decision makes it easier to interpret the model as one of the effects of post-conflict financing strategies by IFIs on the extent of conflict. However, section 3.3 shows that the model can accommodate in-conflict lending, since the results are driven by the inability to pre-commit to a debt level rather than by the timing of lending.

The winner of the contest gets to enjoy the stream of utility generated by consumption in both periods,  $U(c_1) + U(c_2)$ , where it is assumed for simplicity that the discount rate is 0. For given productive efforts, the winner will choose consumption levels to maximize this expression. Given first and second period output levels and standard concave utility functions, this will imply an incentive for consumption

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<sup>26</sup> The model could for example refer to a situation in which there are advantages to status quo possession, so that second period fights would have little marginal impact on power (on the probability of winning the

smoothing through the appropriate choice of  $b$ . Although  $b$  is literally external debt incurred with the IFI by the winner of the contest for resources, the common property nature of the model makes it also easy to simultaneously interpret  $b$  as the fiscal deficit, since the prize of the contest can be interpreted as the ability to control the public sector. With this interpretation in mind,  $\bar{b}$  will alternatively be described as the size of the loan or as the quantitative target on deficits that the IFI imposes as part of the lending program.

I assume that  $f(1,1) < Y_2$ , so that the country would want to borrow in period 1 even in a cooperative equilibrium. Furthermore, desired borrowing is increasing in fighting effort by either group, since fighting implies less resources devoted to productive activities, effectively increasing inter-temporal differences in output. Assume that the country has no access to private capital markets and must rely on IFIs for financing. Although this is consistent with the experience of many countries that have programs with the IFIs, relatively straightforward modifications to the model can accommodate the existence of limited private capital markets. Finally, I assume for simplicity that the interest rate on IFI loans is zero.

With these assumptions, the maximization problem for group 1 can be expressed as

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second stage of the contest), so that both groups would spend the bulk of their resources on productive activities.

$$\begin{aligned} \underset{\{x_1, y_1\}}{\text{Max}} \quad & p(y_1, y_2)[U(c_1) + U(c_2)] \\ \text{s.t.} \quad & \end{aligned} \tag{2.1}$$

$$f(x_1, x_2) + b = c_1 \tag{2.2}$$

$$Y_2 - b = c_2 \tag{2.3}$$

$$y_1 + x_1 = 1 \tag{2.4}$$

$$b \leq \bar{b} \tag{2.5}$$

where (2.1) is the expected utility for group 1, equations (2.2) and (2.3) are the standard dynamic budget constraints, (2.4) is the group's resource constraint, and equation (2.5) is the IFI constraint: debt cannot grow larger than the IFI's target. Group 2 faces similar constraints, although it maximizes over the following objective function:

$$(1 - p(y_1, y_2))[U(c_1) + U(c_2)]$$

Note that with the above formulation, the only cost that conflict imposes on society is the opportunity cost of not producing. In particular, it is assumed for simplicity that conflict does not damage resources (which are fixed at 1) or the production function itself.

The structure of the model allows us to solve for the equilibrium via backward induction. For given values of  $x_1$  and  $x_2$ , whichever group wins the contest will want to smooth consumption and will choose  $c_1 = c_2$ , or equivalently  $b = b^* = \frac{Y_2 - f(x_1, x_2)}{2}$ , if the

debt limit is not binding. If instead the debt limit is binding,  $b=\bar{b}$  and consumption smoothing will be imperfect. If this is the case, group 1's first stage decision on productive effort will solve the following problem:

$$\underset{\{x_1\}}{\text{Max}} \quad p(1-x_1, 1-x_2)[U(c_1) + U(c_2)] \quad (2.6)$$

*s.t.*

$$f(x_1, x_2) + \bar{b} = c_1 \quad (2.7)$$

$$Y_2 - \bar{b} = c_2 \quad (2.8)$$

The first order condition for an interior solution (i.e. levels of  $x_1$  between 0 and 1) is

$$-p_1(U(c_1) + U(c_2)) + pU'(c_1)f_1(x_1, x_2) = 0 \quad (2.9)$$

where  $p_1$  is the derivative of  $p$  with respect to  $y_1$  (marginal power) and  $f_1$  is the derivative of  $f$  with respect to  $x_1$  (the marginal return of productive effort by group 1).

The analogous first order condition for group 2 is

$$p_2(U(c_1) + U(c_2)) + (1-p)U'(c_1)f_2(x_1, x_2) = 0 \quad (2.10)$$

For both groups,  $c_1 = f(x_1, x_2) + \bar{b}$  and  $c_2 = Y_2 - \bar{b}$ , since we have assumed that the IFI debt limit is binding.



Equations (2.9) and (2.10) simultaneously determine the Nash equilibrium of the game, which yields  $x_1(\bar{b})$ ,  $x_2(\bar{b})$  and  $b=\bar{b}$ . Productive efforts by each group are a function of the binding IFI limit, because  $b$  determines the level of utility available after conflict.

### IFI

The final step in our backward induction is the IFI decision. Recalling that all the variables are common knowledge, I assume that the IFI chooses  $\bar{b}$  to maximize the sum of both groups' utilities. With the above specification, this means maximizing *total* utility, which is the size of the prize. In particular, it implies that the IFI has no preference over the identity of the winner of the contest, except to the extent that groups' choices of fighting efforts affect total utility.<sup>27</sup>

The IFI's first best (if it could choose productive efforts) would be  $x_1=x_2=1$ ,  $y_1=y_2=0$  and  $b = \frac{Y_2 - f(1,1)}{2}$ . But the IFI only controls the size of its loans, not the groups' productive efforts. Given this constraint, the IFI chooses the debt limit  $\bar{b}$  as the solution to

$$\text{Max}_b U(c_1(\bar{b}) + U(c_2(\bar{b})) = \text{Max}_b U(f(x_1(\bar{b}), x_2(\bar{b})) + \bar{b}) + U(Y_2 - \bar{b}) \quad (2.11)$$

*s.t.*

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<sup>27</sup> The IFI could alternatively give a grant, either in period 1 or period 2. Both options would increase conflict as will more lending in our model, but total utility would always go up (in this sense they would be similar to increases in  $A$  and  $Y_2$ , respectively), and the absence of second period repayment would change consumption smoothing considerations.

$$\bar{b} \geq 0 \quad (2.12)$$

where (2.12) is a natural restriction that IFIs cannot force a country into a surplus (equivalently, the IFI cannot borrow from the country). This assumption could be relaxed in a model where there is an initial outstanding debt with the IFI that is due for repayment in period one and the IFI can decide on the amount of debt rollover. The IFI could then force the country into a surplus, a case that might be interesting to consider as an extension of the “selectivity” analysis below.

The FOC for an interior equilibrium is

$$U'(f(x_1(\bar{b}), x_2(\bar{b}))) [f_1(x_1(\bar{b}), x_2(\bar{b})) \frac{\partial x_1}{\partial \bar{b}} + f_2(x_1(\bar{b}), x_2(\bar{b})) \frac{\partial x_2}{\partial \bar{b}} + 1] = U'(Y_2 - \bar{b}) \quad (2.13)$$

or dropping the arguments and rearranging

$$U'(c_1) - U'(c_2) + U'(c_1) (f_1 \frac{\partial x_1}{\partial \bar{b}} + f_2 \frac{\partial x_2}{\partial \bar{b}}) = 0 \quad (2.14)$$

A binding level of  $\bar{b}$  reduces a country's ability to smooth consumption, so that  $U'(c_1) - U'(c_2)$  is positive. In fact, this is a standard argument of country authorities against the imposition of deficit targets by IFIs, namely that they are costly because they restrict a country's ability to weather the storm and smooth consumption. However, if this reduction decreases domestic conflict, it could be expansionary by providing groups with an incentive towards productive activities that increase output and diminish the

underlying tilt in income. In an interior equilibrium (in which the IFI sets  $0 < \bar{b} < b^*$ ),

$f_1 \frac{\partial x_1}{\partial \bar{b}} + f_2 \frac{\partial x_2}{\partial \bar{b}}$  is negative, which means that at least one group's productive effort is

decreasing in  $\bar{b}$ .

Before continuing the analysis, we will further specify the model. The literature frequently uses a CSF of the form  $\frac{g_1(y_1)}{g_1(y_1) + g_2(y_2)}$ , where  $g_1$  and  $g_2$  are increasing functions. We will use a generalized version of Hirschleifer's CSF<sup>28</sup>, in which  $g_1 = e^{k_1 y_1}$  and  $g_2 = e^{k_2 y_2}$ , so that the CSF becomes

$$p = \frac{e^{k_1 y_1}}{e^{k_1 y_1} + e^{k_2 y_2}} \quad (2.15)$$

where  $k_1$  and  $k_2$  are parameters scaling the decisiveness of fighting efforts by each group.

This function satisfies our previous assumptions, since  $p_1 > 0$ ,  $p_2 < 0$ , and  $p_{11} < 0$  if  $y_1 > y_2$

while  $p_{11} > 0$  if  $y_1 < y_2$ . It also satisfies  $p_1 = -p_2 \frac{k_1}{k_2}$ , so that the relationship between

marginal powers for both groups ultimately depends on the relative decisiveness of fighting efforts.

Regarding the production function, we will use a standard Cobb-Douglas function,

$$f(x_1, x_2) = A(x_1^a x_2^{1-a})^s = A x_1^{sa} x_2^{s(1-a)} \quad (2.16)$$

where  $a$  indexes the relative productivity of the two groups,  $s$  indexes returns to scale, and  $A$  indexes total factor productivity. It is assumed that  $s \leq 1$ . Finally, we assume  $U(c_1) + U(c_2) = \log(c_1) + \log(c_2)$ .

Replacing  $p_1 = -p_2 \frac{k_1}{k_2}$  in (2.9), solving for  $(U(c_1) + U(c_2))$ , replacing the resulting expression in (2.10), and simplifying we get the following expression:

$$pf_1 \frac{k_2}{k_1} = (1-p)f_2 \quad (2.17)$$

which implies that the effect of a marginal unit of resources devoted to productive activities on expected utility must be equalized across parties, after adjusting for the ratio of the decisiveness of fighting efforts.

Using the above functions, after some manipulation we can reexpress (2.17) as follows:

$$e^{k_1 x_1} k_1 x_1 = e^{k_1 - k_2} e^{k_2 x_2} k_2 x_2 \frac{a}{(1-a)} \quad (2.18)$$

Equation (2.18) shows that changes in  $\bar{b}$  will cause productive efforts by both groups to move in the same direction, so that in an interior equilibrium both groups increase productive effort as the IFI tightens its debt limits. It also shows that relative

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<sup>28</sup> See Hirschleifer (1991)

power depends on the coefficients on the Cobb-Douglas function and the shape of the p function, particularly the parameters  $k_1$  and  $k_2$ .

In the next section, we will analyze the symmetric case in which domestic groups have the same power and exert the same productive efforts. This case will allow us to abstract from power redistribution considerations in the IFIs maximization problem, and focus instead on the relationship between the inefficiency of a particular fighting level and the fact that groups cannot commit to a level of indebtedness. Chapter 3 will consider the asymmetric case, in which one group is more powerful than the other, and this domestic distribution of power is altered by IFI's actions. This will help understand the different reactions of domestic interest groups to IFI-imposed conditions.

### **2.3. Non-cooperative outcomes and the need to cut aid in the symmetric case.**

Consider first the case  $k_1=k_2$  and  $a=\frac{1}{2}$ . By (2.18),  $x_1=x_2=x$ . This implies  $p=\frac{1}{2}$  and  $f_1(x,x)=f_2(x,x)$ . This corresponds to the case where there are no clear distinctions between groups in that they have similar fighting and productive technologies. With an equal chance of winning the contest, each group has the same expected utility. This means that IFI intervention will have no impact on the balance of power within the country. If total utility increases, so will each group's utility. If the IFI's maximization of total utility leads it to prefer debt limits, each group's expected utility will also be maximized. In this case, domestic groups would like to exert lower fighting efforts, but

they have no incentives to do so. IFI targets are a costly but effective commitment device to diminish struggle by reducing post-conflict consumption smoothing.<sup>29</sup> One way to put it is that the country is not only borrowing resources from the IFI, but is also importing credibility at the cost of volatile consumption.

However, this specification doesn't mean that the structure of power has no effect on the outcome. The two groups are not significantly different power-wise, but they still spend resources trying to maintain power (the probability of winning), which leads to an inefficient equilibrium. Fighting leads to excessive debt, because at  $b = \frac{Y_2 - f(1,1)}{2}$  each group would have an incentive to devote some resources to conflict. In the absence of external constraints, both groups would like to reduce debt and produce more, but they cannot credibly commit to borrowing less; the winner of the contest will want to smooth consumption, which implies choosing a higher debt than the ex-ante desired level. If one group were to unilaterally deviate from the equilibrium by dedicating more resources to production, its loss in power would more than offset the increase in total resources.

#### Does conflict decrease when the IFI limits deficits/indebtedness?

As mentioned above, a necessary condition for IFI debt limits to increase total utility is that a reduction in the size of the loan actually reduces conflict and induces production. In the symmetric case, we get the following result:

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<sup>29</sup> If IFI targets are not credible, they cease to serve as commitment devices and conflict cannot be reduced.

**Proposition 2.1.** *An increase in the debt ceiling weakly lowers productive effort, i.e.*

$$\frac{\partial x}{\partial \bar{b}} \leq 0.$$

**Proof.** Note that by (2.15),  $p_1 = p_2$  for all values of  $x_1$  and  $x_2$  when  $k_1 = k_2$ , and that in the symmetric case with  $p = \frac{1}{2}$  and  $f_1 = f_2$ , equations (2.9) and (2.10) are identical. Implicit

differentiation of  $x$  with respect to  $\bar{b}$  in equation (2.9) or (2.10) yields

$$\frac{\partial x}{\partial \bar{b}} = \frac{\frac{k}{2} \left(1 - \frac{Ax^s + \bar{b}}{Y_2 - \bar{b}}\right) + \frac{A(\frac{s}{2})x^{s-1}}{Ax^s + \bar{b}}}{-\left(\frac{k}{2}\right)Asx^{s-1} - \left(\frac{1}{2}\right)\frac{A^2s^2x^{2s-2}}{Ax^s + \bar{b}} + A\left(\frac{s}{2}\right)x^{s-2}(s-1)} \quad (2.19)$$

The numerator is always positive, since a binding  $\bar{b}$  implies that total consumption in period 1,  $Ax^s + \bar{b}$ , is lower than consumption in period 2,  $Y_2 - \bar{b}$ , so that  $1 - \frac{Ax^s + \bar{b}}{Y_2 - \bar{b}} > 0$ .

The first two terms of the denominator are negative, while the third is non-positive, as  $s \leq 1$ .

With symmetric fighting and production technologies, a decrease in  $\bar{b}$  will increase production effort by both groups. Debt limits create a premium on period 1 income, because under liquidity constraints, first period consumption is restricted to output plus the IFI debt, and the marginal utility of consumption is larger in period 1 than in period 2. This in turn creates more incentive to produce in period 1.

One can interpret this result by rearranging group 1's FOC:

$$p_1(1-x_1, 1-x_2)[U(f(x_1, x_2) + \bar{b}) + U(Y_2 - \bar{b})] = p(1-x_1, 1-x_2)U'(f(x_1, x_2) + \bar{b})f_1(x_1, x_2) \quad (2.20)$$

The RHS is the marginal utility of an extra unit of resources dedicated to productive activities. For a given probability of winning, an increase in productive efforts results in an increase of production that increases expected utility. The RHS is decreasing everywhere in  $x_1$ , because  $f$  and  $U$  are concave and because  $p$  is decreasing in  $x_1$ . The LHS can be interpreted as the marginal utility of an extra unit of resources dedicated to fighting, since it equals the increase in the probability of winning times total utility. Its shape depends on two counterbalancing forces. First, as  $x_1$  increases, total production goes up and so does the prize of the contest. Second, as long as  $x_1$  is larger than  $x_2$  (i.e. for high enough values of  $x_1$ ), the marginal power  $p_1$  is decreasing in  $x_1$ .

For a given productive effort of the competing domestic group, a reduction in  $\bar{b}$  results in a decrease in the marginal utility of fighting: the prize of the contest goes down because a lower  $\bar{b}$  causes further consumption volatility. Lower  $\bar{b}$  also increases the marginal utility of productive activities, since the marginal utility of consumption in period 1 is higher, providing further incentives to produce. Both these effects signal an incentive for group 1 to produce more, as figure 2.1 shows.



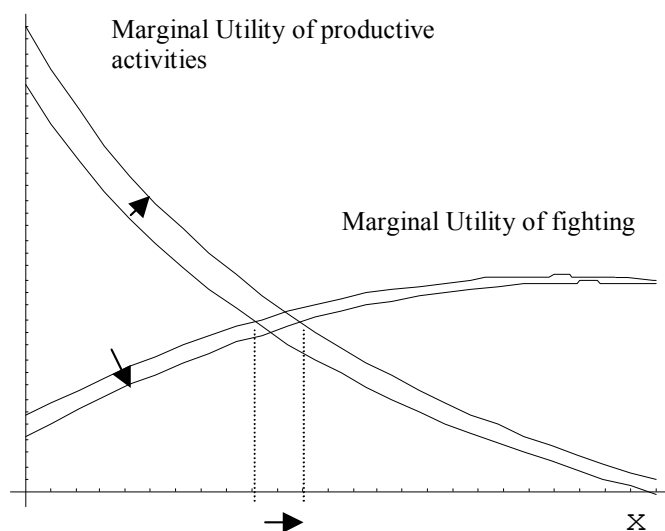


Figure 2.1: Effect of a reduction in  $\bar{b}$  on  $x_1$ , for a given  $x_2$ .

In equilibrium, group 2 also increases its production efforts, which further raises the marginal utility of producing for group 1 because productive efforts are complements for the Cobb-Douglas production function. Higher effort by group 2 will also have an impact on the marginal utility of fighting. First, the size of the prize goes up, as total utility is increased by total production. Second, changes in  $x_2$  can either raise or lower  $p_1$ , depending on whether  $x_1$  is larger or smaller than  $x_2$  initially. Thus, in principle, the marginal utility of fighting can rise or fall with higher  $x_2$ . With the above functional forms, the marginal utility of fighting does in fact go up, but not enough to offset the increase in marginal utility of production, so that optimal  $x_1$  rises, reinforcing the initial effect. The following figure shows the effect of an increase in  $x_2$  on group 1.

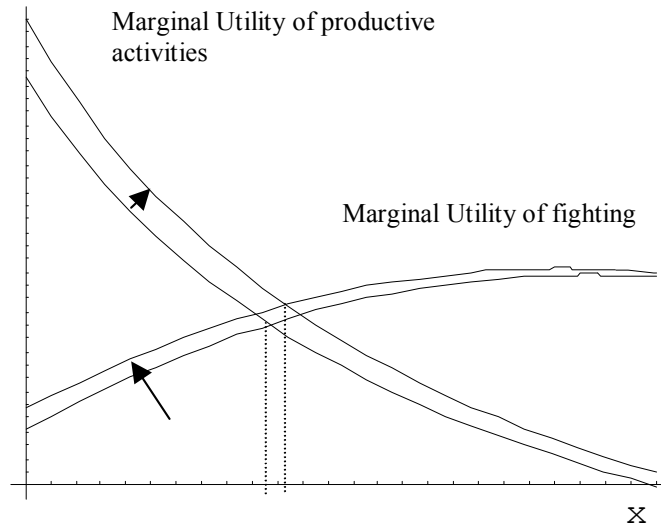


Figure 2.2: Effect of an increase in  $x_2$  on  $x_1$ .

### The IFI's problem again

The result above confirms that the necessary condition for debt limits to increase total utility is satisfied, since limits discourage conflict in the symmetric equilibrium. Nevertheless, from the IFI's point of view, there is still a trade-off between tilting consumption paths and discouraging fighting, and different parameter values can result in different optimal ceilings, covering a range of values of  $b$  from 0 to  $b^*$ .

Proposition 2.2 shows that in this model it is indeed optimal for the IFI to set aid below the first best:

**Proposition 2.2.**  $\left. \frac{\partial U}{\partial b} \right|_{b=b^*} < 0$ .

**Proof.** Using equations (2.13) and (2.19), after some manipulation we get

$$\frac{\partial U}{\partial \bar{b}} = \frac{\frac{1}{2} \frac{A^2 s^2 x^{2s-2}}{(Ax^s + \bar{b})^3} \frac{Ax^s + \bar{b}}{Y_2 - \bar{b}} + \frac{1}{Ax^s + \bar{b}} \left(1 - \frac{Ax^s + \bar{b}}{Y_2 - \bar{b}}\right) \frac{A \frac{s}{2} x^{s-2} (s-1)}{Ax^s + \bar{b}}}{-\left(\frac{k}{2}\right) \frac{Asx^{s-1}}{Ax^s + \bar{b}} - \left(\frac{1}{2}\right) \frac{A^2 s^2 x^{2s-2}}{(Ax^s + \bar{b})^2} + \frac{A \left(\frac{s}{2}\right) x^{s-2} (s-1)}{Ax^s + \bar{b}}} \quad (2.21)$$

Next, evaluate this expression at  $\bar{b} = b^*$ . Since  $b^* = \frac{Y_2 - Ax^s}{2}$ , we get  $\frac{Ax^s + b^*}{Y_2 - b^*} = 1$ ,

and the second term of the numerator equals zero. The first term is positive, while the denominator is negative from proposition 1.

Proposition 2.2 shows that the IFI will always find it optimal to make the debt constraint binding. Optimal  $\bar{b}$  depends on the effectiveness of aid cuts on encouraging production without excessive consumption volatility, which in turn depends on parameter values such as the effectiveness of fighting efforts, total factor productivity and economies of scale.

### *Effectiveness of fighting efforts*

Recall that  $k$  is a measure of the effectiveness of conflict, or how easy it is for one group to increase its winning probability. Increases in  $k$  increase the marginal benefit of conflict, hence giving each group incentives to fight more. In equilibrium, however, this

will not change the probability of winning, which in the symmetric case always equals  $\frac{1}{2}$ . In the absence of IFI constraints, it will rather decrease production and increase indebtedness. Figure 2.3 shows different simulations of the effect of increases in  $k$  on Optimal  $\bar{b}$ .

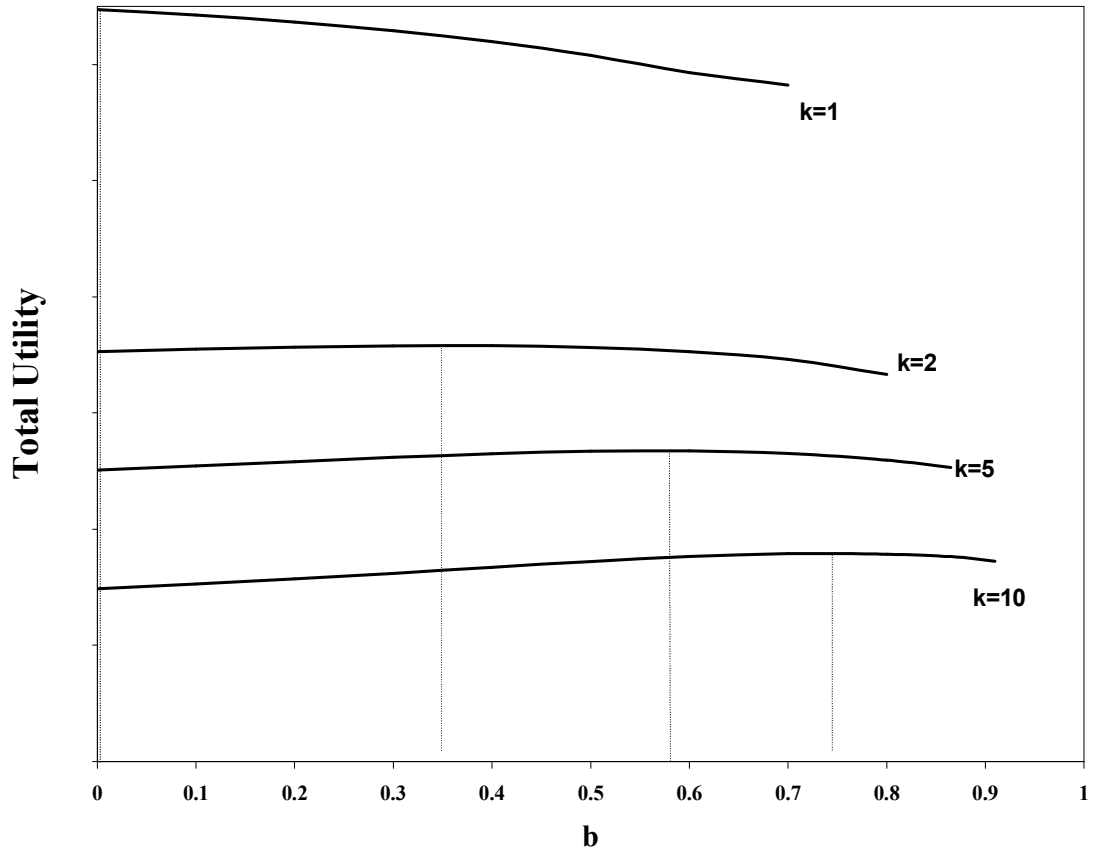


Figure 2.3: Effect of increases in  $k$  on optimal  $\bar{b}$ . Parameter values:  $s=0.6$ ,  $A=1$ ,  $a=\frac{1}{2}$  and  $Y_2=2$ .

Figure 2.3 shows how larger values of  $k$  lead to higher preferred levels of debt and lower utility, because they provide more incentives to fight, which reduces available resources. In all the simulations, the IFI finds it optimal to impose debt limits, but this incentive increases as  $k$  decreases. In other words, the lower  $k$ , the more likely it is that

“selectivity”, or denying all foreign aid, is the best instrument the IFI has to reduce the effects of appropriation activities.

In the case of armed conflict, lower values of  $k$  are associated with lower stages of technological development and less sophisticated means of warfare, or with high geographical fragmentation, which are key elements of primitive societies<sup>30</sup>. Other factors affecting  $k$  are demographic changes (in particular, large migrations to cities), the ease with which natural resources can be appropriated,<sup>31</sup> climatic conditions, international pressures from religious and human rights organizations, or even the presence of peace keeping forces in the country.

More generally,  $k$ 's intensity is also related to different historical, cultural or institutional constraints on appropriation, such as constitutional limits on the distribution of power among federal government, provinces and municipalities, or among the three branches of government. When there are few such constraints, conflict becomes relatively effective. In this case, the IFI can reduce conflict by imposing debt ceilings, but it doesn't have incentives to cut aid altogether, as the volatility in consumption would be too high.

#### *Total Factor Productivity and economies of scale*

The parameter  $A$  is a measure of total factor productivity, usually associated with technological development, but it includes any institutional factors that determine the

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<sup>30</sup> See Anderton (2000) and Skaperdas (1992).

<sup>31</sup> See Michailof et al (2002).

organization of production. Shifts in  $A$  will change domestic groups' incentives to produce or fight. Specifically, they will have two counterbalancing effects. On one hand, increases in  $A$  improve the marginal productivity of both productive efforts, which provides more incentives to produce, but they also put more resources at stake, so that fighting efforts also tend to have higher returns.

Figure 2.4 shows different simulations of the effect of increases in  $A$  on optimal  $\bar{b}$ .

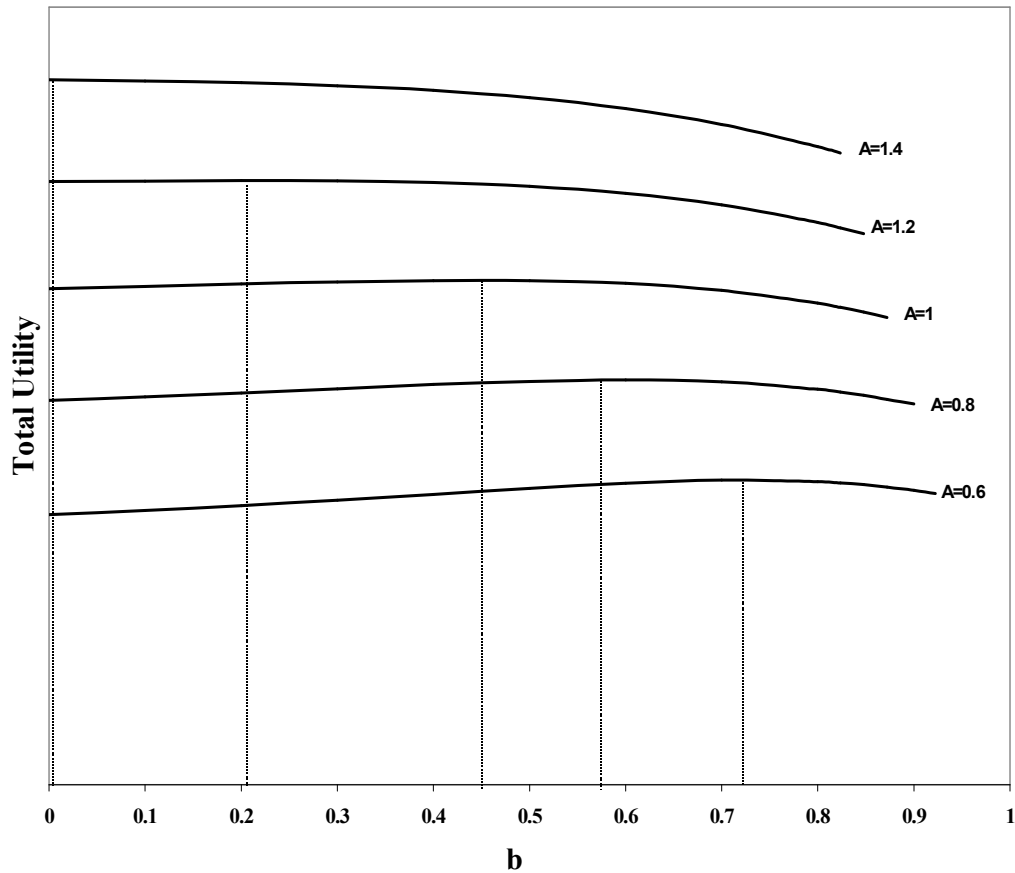


Figure 2.4: Effect of increases in  $A$  on optimal  $\bar{b}$ . Parameter values:  $s=0.6$ ,  $k=5$ ,  $a=\frac{1}{2}$  and  $Y_2=2$ .

For these simulations, a higher  $A$  leads to increases in production (and hence lower levels of  $b^*$ ), but decreases in productive efforts. This is a consequence of the fact that individual groups can afford to fight more without large increases in consumption volatility. This is an income effect of  $A$  that leads to more conflict, and it dominates the substitution effect by which marginal products of productive activities increase. In this context, IFI debt limits become more effective in decreasing fighting efforts as  $A$  increases, and it thus chooses to institute more limits to indebtedness.

The next figure shows different simulations of the effect of increases in  $s$  on optimal  $\bar{b}$ . In this case, a cut off in aid is also more likely when returns to scale increase, except that a higher  $s$  tends to decrease production in the absence of IFI aid, so that the marginal value of decreases in  $\bar{b}$  (as measured by the slope of total utility) is higher.

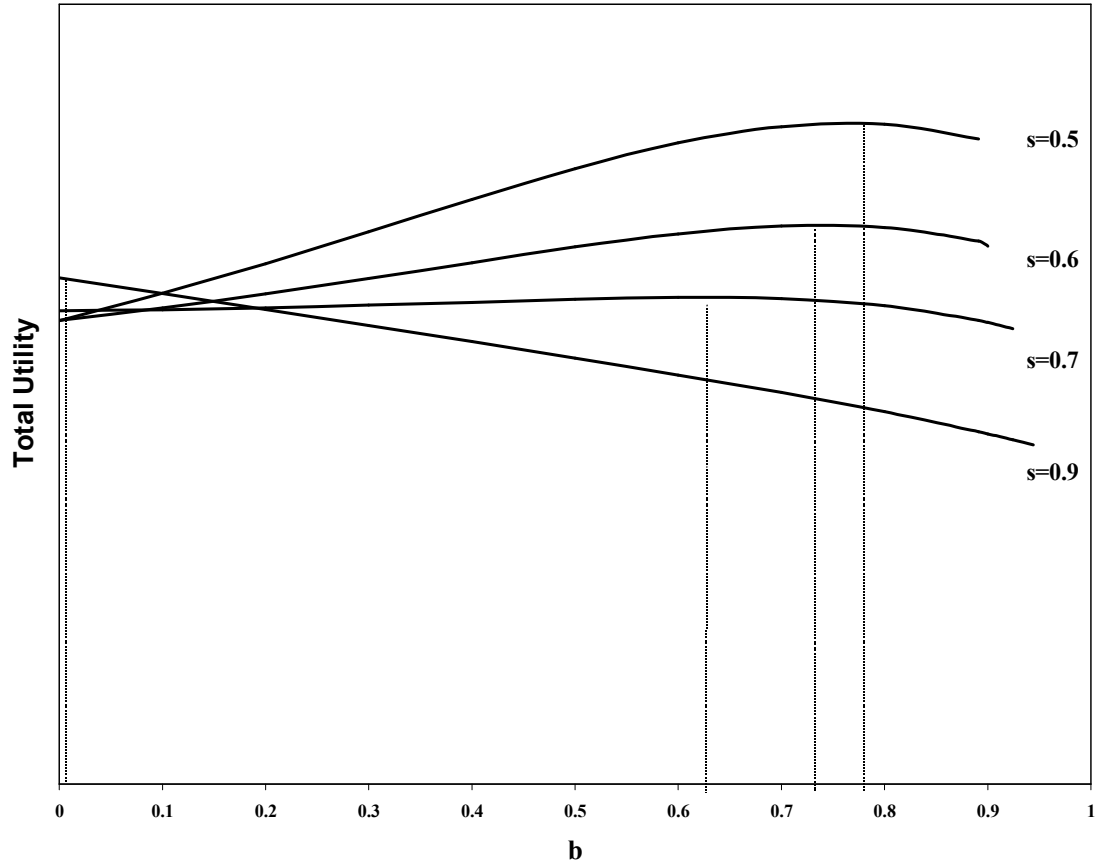


Figure 2.5.: Effect of increases in  $s$  on optimal  $\bar{b}$ . Parameter values:  $k=10$ ,  $A=1$ ,  $a=1/2$  and  $Y_2=2$ .

As the previous sections show, there exist parameter configurations for which a decrease in  $\bar{b}$  is so successful in encouraging production so that total utility is everywhere decreasing in  $\bar{b}$ . In this case, selectivity is called for.<sup>32</sup> Dollar and Svensson (1998) argue in favor of selectivity because “the role of adjustment lending is to identify reformers, not to create them”. In our present context, selectively withholding aid is optimal *because* it contributes to an environment with less conflict, i.e. the policy itself

<sup>32</sup> One additional requirement for zero aid to be optimal is that  $x$  remain bounded below 1 as  $b$  falls. If  $x$  reaches 1 at some  $\bar{b} > 0$ , the optimal policy is to set  $\bar{b}$  at  $x(\bar{b})=1$ , as further decreases in  $b$  do not increase output but cause further tilting of consumption.



has an impact on the domestic political configuration, although it is not necessarily successful in bringing about a fully cooperating equilibrium, as groups might continue to devote resources to fighting.

Drazen (1999) argues that selectivity might prevent a failure of cooperative behavior among domestic groups, as there is a negative correlation between appropriation and the availability of resources. In a model of conflict, a recommendation for selectivity depends on the domestic conditions that generate appropriation, in particular on the parameter values that affect the technologies of conflict and production. I have shown that when reductions in  $\bar{b}$  are relatively unsuccessful in reducing conflict, there might be an interior equilibrium where optimum debt targets are positive, because further tilting of consumption would eventually lower total utility. This is more likely to happen the more effective the fighting methods, and the lower total factor productivity and economies of scale.

Drazen (1999) additionally distinguishes between selectivity and political conditionality- making aid explicitly conditional on a discrete change in the regime- and argues against the latter on the ground that it is much less acceptable politically. However, it can be argued that selectivity is but one extreme example of political conditionality, in which the intensity of appropriation is such that a suspension of the IFI program is the only way to eliminate it. In Drazen's model, the fact that defection will trigger a cut off in aid allows a cooperative equilibrium in repeated interaction games to be supported. In my model, imposing a deficit target or limiting the size of the loan are not explicitly directed at changing a regime, but they implicitly result in an incremental

change in the regime by changing the conditions under which the technology of conflict determines the amount of conflict.<sup>33</sup>

Finally, the model of conflict also allows for the analysis of changes in domestic group's relative power, as the next chapter shows.

## 2.4 Conclusions

In this chapter, we have presented a model in which the degree of conflict depends on the country's overall level of resources, in particular on the availability of external credit. Higher IFI loans increase the possibility of consumption smoothing by the borrowing country, but also decrease the amount of resources devoted to production by increasing the benefits of conflict. In a symmetric equilibrium, we argued that whether selectivity or some positive level of aid is optimal depends on the shapes of the production function and the conflict technology, both of which determine the domestic political equilibrium.

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<sup>33</sup> The difference can be summarized in the phrases "Lending will resume if all of you cooperate" and "This is the size of the loan". Of course, in the latter the objective function of the IFI takes into account the effect of conflict on total utility, so that the expression also considers whether domestic groups cooperate. One mitigating factor is that quantitative targets and sizes of loans in practice depend on other factors, so that it may be hard to distinguish implicit political goals from economic goals when establishing them.

## **Chapter 3: Cooperation and Conflict in the Context of IFI Lending Programs: The Asymmetric Case.**

### **3.1 Introduction**

Chapter 2 of this dissertation showed that when there is a trade-off between production and conflict, a cut off in IFI aid can reduce appropriation and encourage productive efforts by domestic groups. With unrestricted IFI loans, the winner of conflict wants to smooth consumption over time. This affects the incentives of groups at the conflict stage, as a marginal decrease in productive efforts does not imply inter-temporal distortions in the marginal utility of consumption. If instead IFIs make the borrowing constraint binding, an increase by either group in efforts devoted to productive activities will at the margin relax the borrowing constraint by reducing financing needs, which in equilibrium provides incentives to devote fewer resources to fighting. As argued in section 3.4, IFI constraints work because they provide a way to credibly commit the competing groups to a lower level of debt and hence reduce conflict.

By assuming symmetric production and fighting technologies, Chapter 2 focused on the failure of cooperation and avoided any issues of power redistribution. In practice, one frequently observes domestic groups protesting conditions imposed by IFIs, which might be a reflection of the fact that said policies do in fact cause changes in their power. This is possible if domestic groups have significantly different fighting and/or productive technologies, so that changes in the amount of indebtedness not only affect the *amount* of

conflict, but also contribute to shape the distribution of power among domestic groups, and hence the *outcome* of conflict.

To address the issue of domestic distribution of power, I use the model in Chapter 2, which explains conflict as a contest among players with the acquisition of property rights over the contested resources as the prize, and defines the probability of winning the contest as power. In Chapter 3, I pay special attention to the Production and Contest Success Functions, which contain the key parameters that can potentially differentiate domestic groups. I argue that asymmetry in productivity and fighting technologies implies that domestic groups have different levels of power, and furthermore, that a cut off in aid causes their relative power to change, which makes domestic groups differ in their preferred levels of IFI aid.

In section 3.2, the basic elements of the model of section 2.2 are restated. Section 3.3 considers the asymmetric cases where  $a \neq 1/2$  and  $k_1 \neq k_2$ , respectively. It shows that power considerations make groups prefer different IFI constraints. Section 3.4 discusses the case of in-conflict financing (as opposed to post-conflict financing), and relates it to the ability of a domestic group to commit to a particular debt level. Section 3.5 concludes.

### **3.2. The model**

Since the model in this chapter is the same as the one in section 2.2, I will only restate those elements that are essential to the asymmetric case. Regarding the CSF, recall that section 2.2 assumed the following functional form:

$$p = \frac{e^{k_1 y_1}}{e^{k_1 y_1} + e^{k_2 y_2}} \quad (3.1)$$

where  $k_1$  and  $k_2$  are parameters scaling the decisiveness of fighting efforts by each group.

In chapter 2, I showed that this CSF function satisfies  $p_1 = -p_2 \frac{k_1}{k_2}$ , which shows that differences in  $k$  translate into differences in marginal power, and these differences will be an important source of asymmetry in equilibrium productive and fighting efforts.

Regarding the production function, we used a standard Cobb-Douglas function,

$$f(x_1, x_2) = A(x_1^a x_2^{1-a})^s = A x_1^{sa} x_2^{s(1-a)} \quad (3.2)$$

where  $a$  indexes the relative productivity of the two groups in productive efforts, with

$a \neq \frac{1}{2}$  being the second source of asymmetry in the model.

Using the fact that  $p_1 = -p_2 \frac{k_1}{k_2}$ , after some manipulation of first order conditions

for groups 1 and 2, we get the following condition:

$$p f_1 \frac{k_2}{k_1} = (1-p) f_2 \quad (3.3)$$

Replacing (3.1) and (3.2) in (3.3), we obtain

$$e^{k_1 x_1} k_1 x_1 = e^{k_1 - k_2} e^{k_2 x_2} k_2 x_2 \frac{a}{(1-a)} \quad (3.4)$$

Equation (3.4) shows that productive efforts  $x_1$  and  $x_2$  will move in the same direction in response to a change in  $\bar{b}$ . Additionally, it shows that the groups' relative power depends on the coefficients on the Cobb-Douglas function and the shape of the p function, particularly the parameters  $k_1$  and  $k_2$ .

### 3.3. How are domestic groups helped or hurt by IFI constraints?

Assume first that  $k_1=k_2$ , and  $a<1/2$ . In this case, (3.4) becomes

$$e^{kx_1} x_1 = e^{kx_2} x_2 \frac{a}{(1-a)} \quad (3.5)$$

Since  $\frac{a}{(1-a)} < 1$ ,  $e^{kx_1} x_1 < e^{kx_2} x_2$ , which implies  $x_1 < x_2$ , i.e. the less productive group 1 devotes more resources to fighting. This corresponds to the observation in Skaperdas (1992) that groups with less valuable productive resources have a lower opportunity cost of fighting and thus have more power.

Differentiation of (3.5) yields

$$\frac{\frac{\partial x_2}{\partial \bar{b}}}{\frac{\partial x_1}{\partial \bar{b}}} = \frac{(1-a) e^{kx_1} (kx_1 + 1)}{a e^{kx_2} (kx_2 + 1)} \quad (3.6)$$

Using (3.5), after some manipulation (3.6) becomes

$$\frac{\frac{\partial x_2}{\partial \bar{b}}}{\frac{\partial x_1}{\partial \bar{b}}} = \frac{(x_1 x_2 + x_2)}{(x_1 x_2 + x_1)} > 1 \quad (3.7)$$

As shown above, if  $a < 1/2$ ,  $x_2 > x_1$ , and since  $k_1 = k_2$ , this implies that group 1 is relatively powerful. In addition, according to (3.7), decreases in  $\bar{b}$  that increase  $x_i$  will also change disparities in fighting efforts. Since  $\frac{\partial x_i}{\partial \bar{b}} < 0$ ,  $\frac{\partial x_1}{\partial \bar{b}} > \frac{\partial x_2}{\partial \bar{b}}$  and  $\frac{\partial y_2}{\partial \bar{b}} > \frac{\partial y_1}{\partial \bar{b}}$ . Furthermore, when groups have different productivities, the powerful group becomes more powerful as  $\bar{b}$  decreases, as the following proposition shows.

**Proposition 3.1.** *When  $a < \frac{1}{2}$  and  $k_1 = k_2$ ,  $\frac{\partial p}{\partial \bar{b}} < 0$ .*

**Proof.** Taking the derivative of (3.1) with respect to  $\bar{b}$ , one obtains

$$\frac{\partial p}{\partial \bar{b}} = \frac{ke^{ky_2} e^{ky_2} [\frac{\partial y_1}{\partial \bar{b}} - \frac{\partial y_2}{\partial \bar{b}}]}{(e^{ky_2} + e^{ky_2})^2} \quad (3.8)$$

By (3.7),  $\frac{\partial y_2}{\partial \bar{b}} > \frac{\partial y_1}{\partial \bar{b}}$  so that (3.8) is negative.

A consequence of proposition 3.1 is that domestic groups have differing attitudes towards IFI debt targets.<sup>34</sup> Because of power considerations, optimal  $\bar{b}$  for the powerful group 1 is lower than the one chosen by the IFI, and the opposite is true for the group with less power. Interestingly enough, the more productive (less powerful) group prefers higher deficits. Although an increase in  $\bar{b}$  starting from the IFI's preferred level would decrease productive efforts and increase fighting efforts by both groups, the initially powerful group loses some power despite spending more resources in fighting, because the increase in fighting effort for group 2 is larger and more effective given that  $p_{11} < 0$  for  $y_1 > y_2$ . Figure 3.1 considers an example that displays these features.

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<sup>34</sup> An interesting extension of the model would allow domestic groups to exert effort against targets by IFIs at the  $\bar{b}$  setting stage in an attempt to set the loan size at a level more favorable to them in terms of their relative strength.



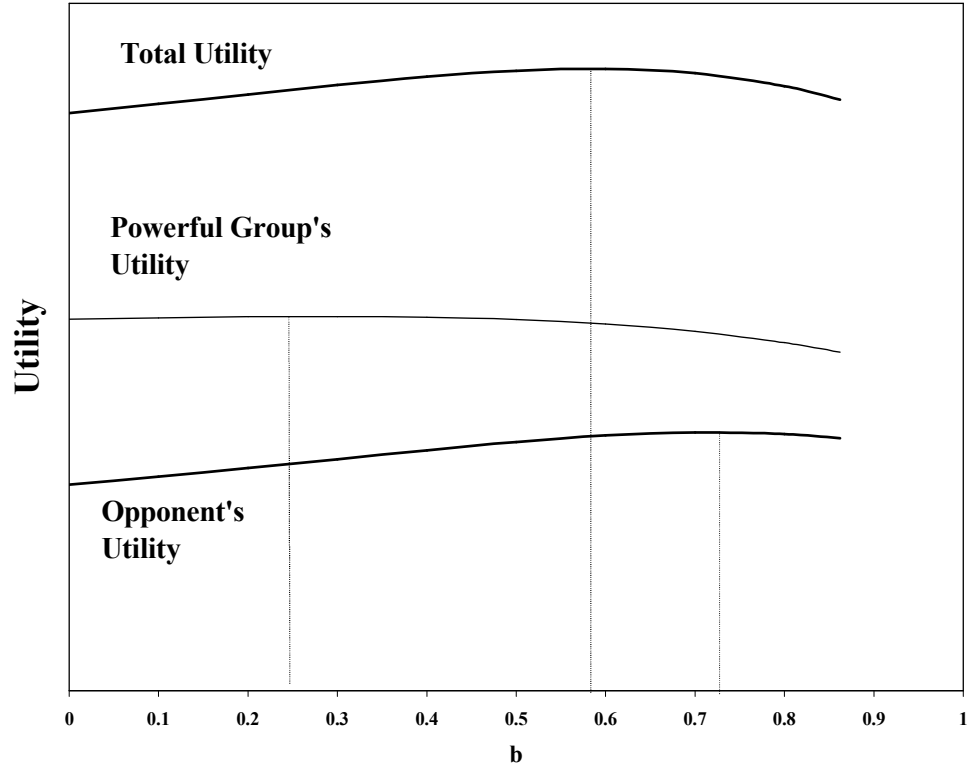


Figure 3.1: Asymmetric Productivities and Utility. Parameter values:  $a=0.3$ ,  $k=5$ ,  $A=1$ ,  $Y_2=2$  and  $s=0.6$ .

Next, assume  $a=1/2$  and  $k_1 > k_2$ . This asymmetry concerns the power function and differs from the one considered above because marginal power is now different for each group. Proposition 3.2 shows that in equilibrium the group with the higher  $k$  will have more power.

**Proposition 3.2.** *If  $a=1/2$  and  $k_1 > k_2$ ,  $p > 1/2$ .*

**Proof.** If  $a=1/2$  and  $k_1 > k_2$ , (3.4) becomes

$$e^{k_1 x_1} k_1 x_1 = e^{k_1 - k_2} e^{k_2 x_2} k_2 x_2 \quad (3.9)$$

Since  $k_1 > k_2$ ,  $\frac{e^{k_1}}{e^{k_2}} > 1$ . According to (3.9),  $\frac{e^{k_1}}{e^{k_2}} > 1$  implies  $e^{k_1 x_1} k_1 x_1 > e^{k_2 x_2} k_2 x_2$ , or

$k_1 x_1 > k_2 x_2$ . This in turn implies  $p > 1/2$ .

In equilibrium, group 1 is powerful, and it can additionally invest more in productive efforts ( $x_1 > x_2$ ), because its comparative advantage in fighting allows it to devote less resources to conflict and still have a higher probability of winning. If this is the case, the powerful group might actually prefer a higher debt limit than the IFI (as opposed to the case where  $k_1 = k_2$ , and  $a \neq 1/2$ ), because both larger  $k$ s and  $y_1 < y_2$  mean that group 1 increases its power when fighting efforts increase. Figure 3.2 displays such an example, in which additionally the weaker group's utility is everywhere decreasing in  $\bar{b}$ , so that it prefers a cutoff in IFI aid.

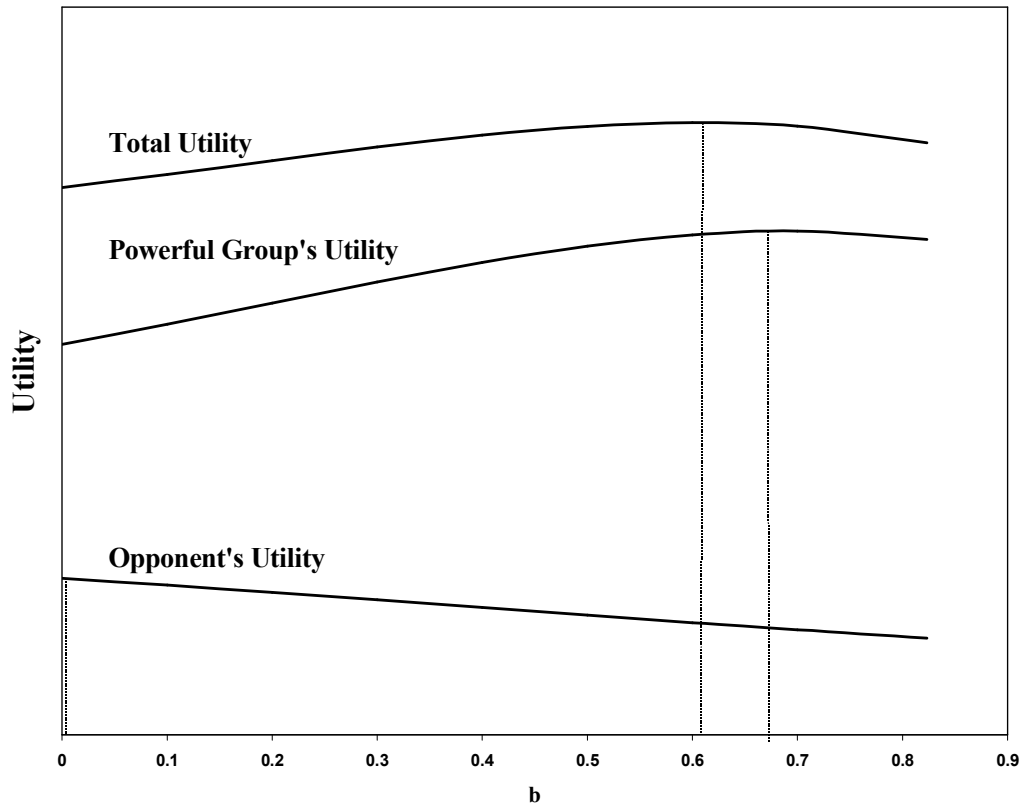


Figure 3.2: Asymmetric Fighting Technologies and Utility. Parameter values:  $a=0.5$ ,  $k_1=6$ ,  $k_2=3$ ,  $A=1$ ,  $Y_2=2$  and  $s=0.6$ .

### 3.4. In-conflict versus Post-Conflict financing and the ability to pre-commit to $b$ .

The model of IFI intervention used in sections 2.2 and 3.2 has been described as one of post-conflict financing, since it is the winner of the contest that chooses  $b$  (subject to the restriction that it be lower than  $\bar{b}$ ). In reality, IFIs often provide lending *while* there is an ongoing conflict. This change in timing seems to change the nature of the relationship between the choices of  $x_i$  and  $b$ .

However, the key element of the above equilibrium is not necessarily the timing of debt choices, but rather the circumstances surrounding them. In particular, different institutional arrangements (or “property rights regimes”) for the choice of  $b$  can be in place. If those arrangements make it difficult for one group to have complete control of  $b$  at the fighting stage of the game (“ability to pre-commit” to a level of  $b$ ), the model in previous sections can still accommodate in-conflict financing. If instead one group has the ability to pre-commit to a level of  $b$  (for example, administrations may have relatively more legal means of setting debt levels or negotiating with IFI authorities), it can use this variable as a strategic device to affect the degree of conflict and its outcome.<sup>35</sup>

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<sup>35</sup> The model could be generalized by explicitly modeling how conflict affects the ability of groups to choose a particular deficit level, although there would still exist potential for the IFI to provide a better commitment device that would simplify this choice by limiting the amount of debt.

Would groups having the ability to pre-commit pursue an agreement with IFIs during the conflict to try to affect the outcome of the contest? Would our conclusions about the effect of debt limits on the level of conflict change in such a scenario?

In the symmetric case, if both groups can pre-commit to a level of  $b$ , there would be no additional role for the IFI through its choice of  $\bar{b}$ . The pre-commitment level of  $b$  would in fact be the same as the debt level chosen by the IFI in section 2.3, since that level maximizes total utility and -for equal power- also maximizes each group's expected utility. This suggests a limited role for IFIs to improve upon the domestic situation through constraints.

If, on the other hand domestic groups have different fighting and productive technologies, so that power is asymmetric, the pre-commitment equilibrium could differ from the IFI debt limit. For example, if the administration is relatively more productive (and hence less powerful) than the opposition, its power would dwindle as debt decreases. Hence, an administration that can pre-commit would choose an inefficiently high level of  $b$ , to avoid losing power. In this case there would still be room for IFI limits to improve welfare, as a debt limit below the administration's desired level leads to higher total utility. It should be pointed out that although there is still no explicit link between an IFI's policies and regime change, the IFI would more likely be seen as interfering with the domestic political equilibrium in this case, as from the point of view of the administration the main purpose of the IFI's actions is to limit its power.

Assume instead that there is a relatively unproductive administration. In this case, cutting aid allows groups to reach an equilibrium with less conflict, and at the same time it strengthens the administration's power base. This provides incentives to the

administration to commit to debt at a level lower than  $\bar{b}$ , which would maximize  $p(U(c_1) + U(c_2))$ , but not  $U(c_1) + U(c_2)$ . In this case, IFI policy would be ineffective in maximizing total utility, since the IFI cannot force the administration to borrow more than its pre-commitment level.

### **3.5. Conclusions**

This chapter has studied the power implications of asymmetric production and fighting technologies in a model in which the degree of conflict depends on the availability of external credit. In such a scenario, IFI aid can result in a re-distribution of power among domestic groups, as the strategic advantage of relatively productive (and hence less powerful) groups is increased as the IFI increases the size of its loan. Weaker groups would therefore prefer larger debt limits. On the other hand, the power of groups with comparative advantage in fighting may be increased as IFI loans increase, as an increase in their fighting efforts has a larger marginal impact on power.

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